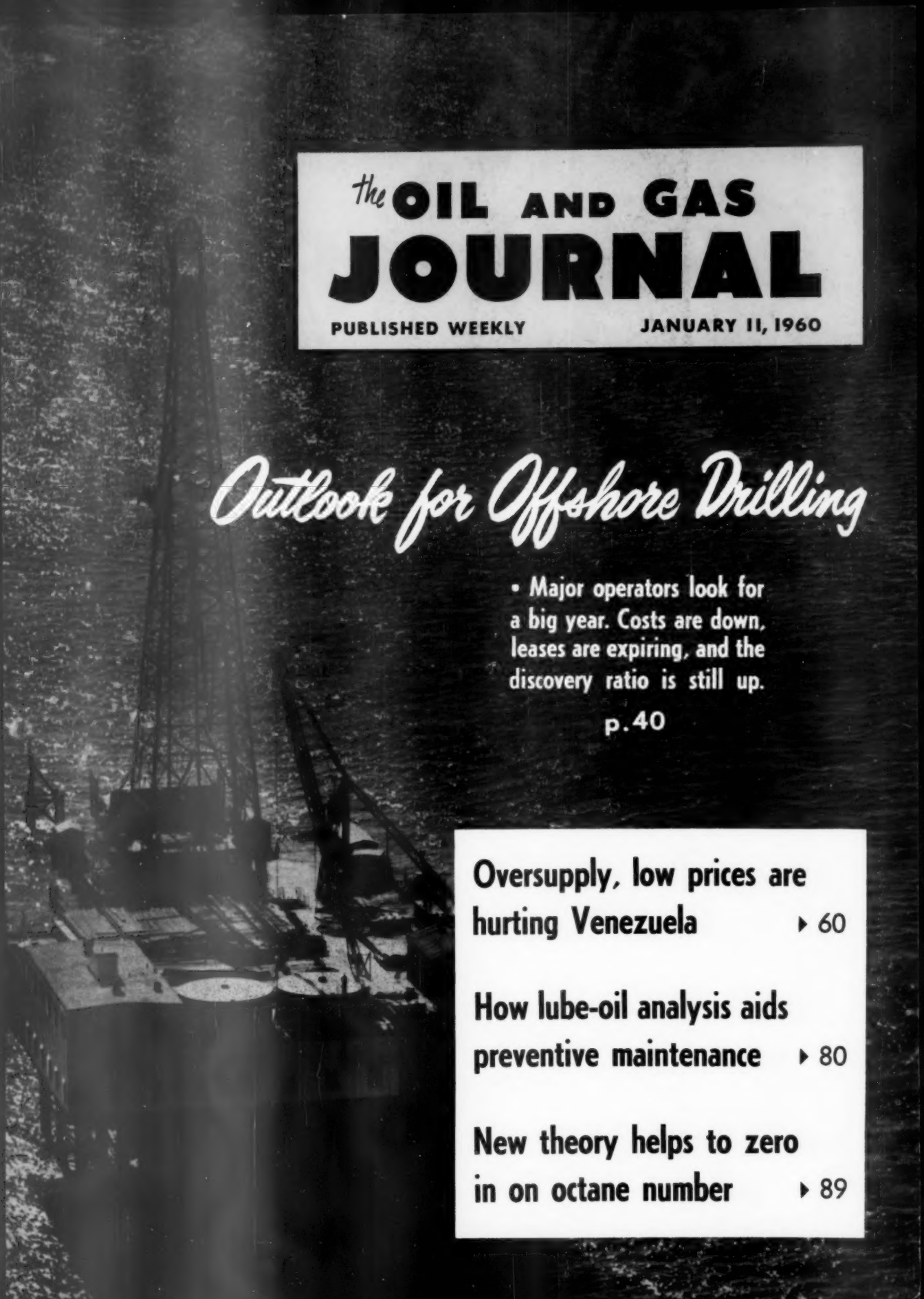

the OIL AND GAS JOURNAL

PUBLISHED WEEKLY JANUARY 11, 1960

Outlook for Offshore Drilling

• Major operators look for a big year. Costs are down, leases are expiring, and the discovery ratio is still up.

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Oversupply, low prices are hurting Venezuela ▸ 60

How lube-oil analysis aids preventive maintenance ▸ 80

New theory helps to zero in on octane number ▸ 89

Chicago Pneumatic

FORT WORTH, TEXAS

REPRINTS SUITABLE FOR FRAMING
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31 YEARS OF SERVICE
TO THE PETROLEUM INDUSTRY

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REAMING BITS

OIL AND GAS JOURNAL
Vol. 58 No. 2

Contents January 11, 1960

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Annual index available on request.

TECHNOLOGY—OPERATION

Production:

Oklahoma's Water-Flood Production Should Not Be Curtailed 67

By W. E. Stiles

State water-flood production is 139,500 bbl. per day, or an average of 4.89 bbl. per day per well. Restriction of water-flood production rate would affect only a small number of the floods at any one time, and those affected would be producing at the critical period of peak rate.

Reservoir Engineering—18. 95

By E. T. Guerrero and F. M. Stewart

How to obtain a k_g/k_o curve from laboratory steady-state relative-permeability measurements.

Drilling:

Mechanical Setting Tool Cuts Cost of Packers 86

By Frank Sharp and A. E. Cummins

The new tool is operated by reciprocation on the wire line on which the packer is run. It is just as efficient as other setting tools and is more economical. It may be used to set bridge plugs, squeeze packers, or production packers.

Tandem Trailer Helps Tank-Battery Hookup 88

Tractor pulls trailer to site and leaves it there to serve as base of operation.

Pipelining:

Tests Shed Light on Orifice-Plate Bending 76

By S. P. Belonos and R. W. Davis

Lab results indicate that for all practical purposes, the orifice plate in orifice fittings acts as a uniformly loaded plate with a central hole simply supported at the outer edge; field tests followed the same pattern.

General:

Floating Plastic Tank Hauls Oil Products 84

By M. Swiss

Huge sausage-shaped tank holds over 10,000 gal. and can take a lot of punishment. Filling from collapsed state takes 15 minutes.

Refining-Processing:

Radioactive Tracers Pinpoint Entrainment 70

By G. B. Hoekstra, A. I. Snow, L. A. Baillie, and J. S. Curtice

Part 2 of two parts. Effectiveness of tracer was proved by color comparison. Demister pad sharply reduces entrainment.

How Chromatography Can Improve Gasoline-Plant Profits 73

By Tom Mitchell

This valuable tool can help to increase production, reduce costs, and meet quality requirements.

Pressure Regulator Improves Operation of Gas-Blanketing System 79

Lube-Oil Analysis, A Practical Tool in Preventive Maintenance. 80

By W. E. Scruggs

Nine years of experience prove analysis of lube-oil samples from engines and turbines can help the preventive-maintenance program. Tests pinpoint troubles, indicate needed oil changes.

New Magnetic-Tape Drive for Data-Processing Systems 83

How Costs Will Be Cut in Tomorrow's Refineries 85

New Knock-Test Method Promises Savings 89

By G. A. MacDonald

Fresh approach to more precision in obtaining octane numbers of motor fuels is based on theory that the time at which detonation occurs in the combustion cycle is the factor that determines the intensity of that detonation.

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the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Jan. 11, 1960

Oil men can count on plenty of steel for 3 years:

Question now is what's going to happen to steel prices when wage increases take effect under new union contract.

Workers got 40 cents an hour more in wage and benefits. The insurance, pension, and other benefits take effect immediately. Wage boosts ranging from 7 to 13 cents an hour become effective on Dec. 1, 1960 and again on Oct. 1, 1961.

Oil suppliers say the steel makers tell them they plan no immediate price increases. It's a fair bet, though, that steel prices will advance before the year is out.

Oil buying actually is slow now. Oil men weren't hedging against a strike—probably won't hedge against price hikes. They know in few short months any steel pinch will be over.

▼ ▼ ▼

Watch for developments on these issues as Congress gets under way:

Federal leasing law revisions. An omnibus bill approach is likely, including Alaskan regulations which were killed last year. Industry opposition to an increase in rentals may be dropped as the "price" for passage of other changes.

Natural gas bill. President Eisenhower may boost industry hopes by asking Congress for such legislation. Whether he does or not, some segments of the industry will press for a bill, even though the outlook is far from bright in 1960.

Highway program. This will develop into one of the bitterest fights of the entire session, particularly over financing and alleged waste. The administration will stick to a pay-as-you-go approach, and thus will probably ask for another gasoline tax hike.

Cooperatives. Jobbers will push for taxation of petroleum marketing cooperatives, but congressional action may be delayed until the House ways and means committee has finished its over-all tax study. Jobbers will also support legislation to permit tax deductions on pension plans for self-employed persons.

Proposals concerning a federal fair trade law, functional

discounts, a hike in minimum wage to $1.25 an hour, and attacks on percentage depletion are other points the oil industry will be watching closely.

▼ ▼ ▼

Tally on 1959 petroleum output from Bureau of Mines:

...Crude up 5% with production totaling 2,571 million barrels. Gain due to better demand and imports controls. Average value of crude at the well for year was $2.94 per barrel, a decline of 7 cents.

...Natural-gas liquids up 9% to 13,447 million gallons due to heavy LPG demand last summer. Average value of liquids at plants was unchanged at 5.6 cents per gallon.

...Natural gas up 3% to 11,400 billion cubic feet. Average value at wellhead increased to 12.1 cents per M.c.f. from 11.9 cents in 1958.

Oil slipped slightly but still represents more than half of the nation's total mineral value.

The breakdown for petroleum:

	1959	1958
	(Billion $)	
All minerals	17.1	16.5
Crude petroleum	7.56	7.38
Gas liquids	.75	.69
Natural gas	1.38	1.31
Total oil and gas	9.69	9.38
Oil's share of total	56.7%	56.8%

▼ ▼ ▼

API's year-end summary gives this 1959 picture:

...Domestic demand 9,516,000 bbl. daily compared with 9,083,000 in 1958, a gain of more than 4%.

...Total demand 9,748,000 bbl. daily compared with 9,358,000 the year before.

...Domestic supply 7,909,000 bbl. daily against 7,518,000 in 1958.

...Imports 1,740,000 bbl. daily, up 40,000 bbl.

...Total supply 9,649,000 bbl. daily, up 96,000 bbl.

...Natural-gas liquids more than 319,000,000 bbl. for a new record.

...Refining capacity down to 9,803,000 bbl. daily from 9,819,000 year before. Throughput was 7,983,000 bbl. daily, about 341,000 bbl. daily higher than 1958.

...Motor-fuel production hit new peak of 1,490,000,000 bbl. and distillate fuel set record of 681,000,000 bbl.

...Inventories of products at year end are off from year ago. So are crude stocks.

...Well completions for year will run about 51,000, up 2,000. Footage drilled will be 211,000,000, up 14,000,000.

...Capital spending $5,500,000,000, up $200,000,000.

New drilling-depth record for Williston basin and North Dakota has been set at Amerada's 1 Antelope Unit in Antelope field of McKenzie County.

The wildcat has reached 15,135 ft. in Precambrian. Previous record was Amerada's 9-A Unit in Beaver Lodge field which was drilled to 14,828 ft. in 1957.

Two wildcats in Utah bear watching.

The McDermott 1 State and Shell 1 Soda Unit, both in Kane County portion of the remote Kaiparawits basin could open a vast new theater of drilling. Success at either could put southern Utah into a hot drilling campaign this year (p. 123).

Pure's important 1 Lisbon discovery in San Juan County, Utah, has been completed as substantial producer.

The rundown: Initial production 586 bbl. daily of 45.2°-gravity oil through 14/64-in. choke from 70 ft. of perforations in McCracken sandstone from 8,261-93 ft. and from 8,310-48 ft. Flowing pressure on tubing was 250 psi.

Earlier at 7,539-8,235 ft. almost 700 ft. of Mississippian limestone showing commercial quantities of natural gas was encountered. But gas will not be produced now. Pure is planning offset 2,000 ft. southeast and holds nearly 80,000 net acres in the Lisbon trend.

▼ ▼ ▼

Drilling-production notes:

Billion-barrel oil field in California may never be tapped because of subsidence (p. 45)...Louisiana offshore activity will stay good this year with emphasis on development drilling. New sales, however, may boost exploration too (p. 40)...Gulf has set a drilling speed record by going to 10,000 ft. in 4 days in an offsshore well (p. 44)...Headlee field operators are restored to allowable production in Texas after severe cutbacks to save field's pressure (p. 56)... Operators in New Mexico like that state's simplified tax-paying plan (p. 57)...A new conservation law will be considered by the next Kentucky legislature (p. 59).

Contract oil-well servicing is gaining favor among oil companies.

More and more are turning over their workovers, rod and tubing jobs, cleanouts, and general service work to contractors. Companies formerly did about half this work themselves.

Stimulants to contract servicing are: Lower costs and availability of service units just about everywhere (p. 48).

▼ ▼ ▼

Some crude price changes:

Republic Oil Refining cut 10 cents per barrel off 3,500 bbl. daily in seven South Texas fields. New price is

$3.25 bbl. for 40°-gravity and above with 2-cent per degree differential downward. Affected were Green Lake, Heyser, Long Mott East, Long Mott South, McFaddin East, Shariff, and Shariff East fields.

Union Oil increased prices for Four Corners crude by 15 cents per barrel. New schedule tops at $2.75 bbl. for 40°-gravity oil with 2-cent differential. Union posts in Aneth, Ratherford, White Mesa, and McElmo Creek fields.

Shell is making initial posting in Venezuela for lifting at new Puerto Miranda terminal on Lake Maracaibo. Postings are Lagotreco $2.27, Lagunillas $2.07, Bachaquero $1.70, and Boscan $1.57.

▼ ▼ ▼

Socony Mobil is boosting the antiknock properties of tetramethyl lead.

Socony engineers claim it is better than tetraethyl lead in some applications. First use likely will be in the gasolines high in aromatics and low in olefins, such as the catalytic reformates. Socony researchers predict it will replace ethyl in time (p. 50).

Cornerstone for $50-million, 65,000-bbl. daily refinery at Mersin on southeast Mediterranean coast of Turkey has been laid by Turkish Prime Minister Adnan Menderes.

Plant will go on stream in last half of 1961. Foster-Wheeler is contractor. Ownership is Mobil 56%, Royal Dutch-Shell 27%, BP 17%. Caltex, once in the group, has signed an agreement with Turkish Petroleum to build 20,000-bbl. plant near Istanbul.

Order for 100 miles of 30-in. pipe for line to move Libyan crude to the Mediterranean has been placed by Esso Standard (Libya).

Not yet decided, however, is route or terminal site.

Pipe was ordered from South Durham Steel in England as hedge against shortages. It probably will be midyear before drilling at Zelten is far enough along to evaluate the key discovery and before pipeline engineering studies are made.

Esso last week tested Zelten 4 at rate of 2,500 bbl. daily. The discovery flowed 17,500 bbl. daily; No. 2 at rate of 15,000 bbl. daily; and No. 3 at rate of 1,600 bbl. daily from a different producing horizon.

Decentralization isn't all economy, some oil companies going that route are finding.

Humorous case in point: One company used to service payrolls for more than 4,000 employes with four clerks and spare helpers 2 or 4 days a month.

Now with checks issued in division and other offices, it takes 35 full-time workers to process the checks. And besides the checks often are late.

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gives you new-pump performance at maintenance prices

Plunger for reconditioned pump is carefully measured to assure perfect fit in re-honed liners.

Micrometer gauges inside diameter of reassembled sectional liner barrel to check accuracy of assembly.

SPUN METAL sectional liner subsurface pump barrels are ideal for medium abrasive and corrosive conditions. When wear eventually causes loss of pump efficiency, they can be exchanged for identical reworked barrels at less than half their original cost.

With this type barrel, the foot-long sectional liners of SPUN METAL are factory re-honed to original quality standards . . . reassembled in perfect alignment on "Oilwell's" exclusive expanding mandrel . . . reinserted in a reconditioned jacket . . . and are ready to be refitted with the correct-size plunger to perform as good as new.

Most "Oilwell" pump shops maintain large stocks of these reworked SPUN METAL barrels in bores and lengths that are locally popular—made up ready to go. Thus exchanges can be made without delay and any other parts requiring replacement can be included as the pump is reassembled.

The specialist in the subsurface pump shop at your nearest "Oilwell" store will be glad to advise on your pump problems . . . and give you more detailed information on "Oilwell's" exchange service on sectional liner pumps.

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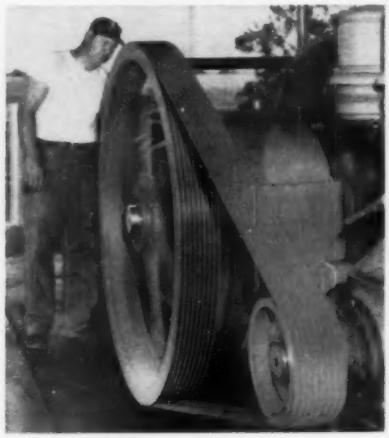
B.F.Goodrich

V belt briefs

TIPS ON THE CARE, MAINTENANCE AND SELECTION OF V BELTS FOR INDUSTRY

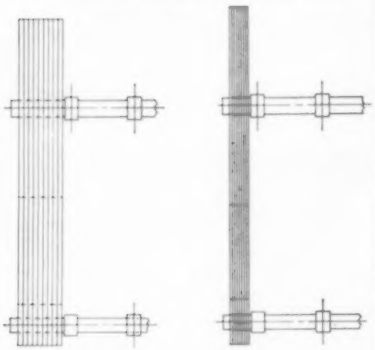
ORDINARY V BELT DRIVE



MAXIPOWER DRIVE

SAVE $402.14 ON V BELT DRIVES—*Costs for* both *sheaves and V belts were cut when B.F. Goodrich Maxipower belts replaced ordinary belts on this drive. Size and weight of sheaves were reduced, smaller and fewer V belts were used*—eight *5V2500 belts replaced* nine *D-240 belts. The result: a $402.14 saving. Costs can be cut as much as 30% by switching to a Maxipower V belt drive.*

How Maxipower V belts reduced bearing load 42%

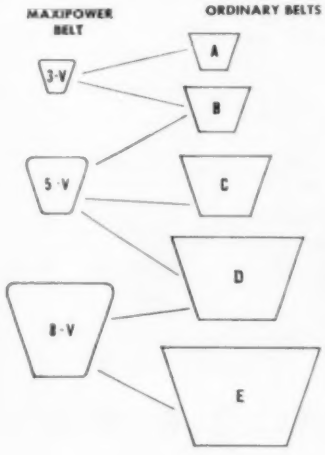


ORDINARY DRIVE MAXIPOWER DRIVE

In the installation shown above, sheaves for the Maxipower drive are lighter, have a face width of only 5 13/16", compared to a 13¼" width for the sheaves on the ordinary drive. Because there's less weight, less shaft overhang, bearing load for this Maxipower drive is 42% less for the driven shaft shown than the drive replaced. This greatly increases bearing life.

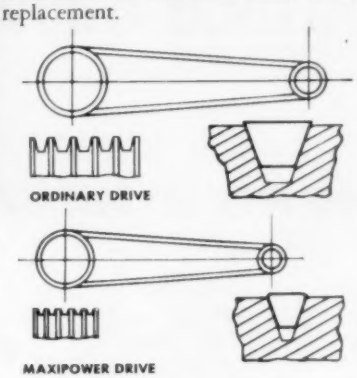
With Maxipower V belts, three cross sections do the work of five

Each cross section of the new B.F. Goodrich Maxipower V belts has been fitted to a particular horsepower range so that only three cross sections are needed instead of the A, B, C, D, and E sections of conventional V belts. The three cross sections are 3V, 5V and 8V.



New BFG Maxipower V belts save space, weight, bearings, dollars

New B.F.Goodrich Maxipower V belts give up to three times the horsepower-carrying capacity in the same amount of space as ordinary belts. This more compact drive gives you more horsepower per dollar, results in substantial savings, both in initial costs and often in belt replacement.



ORDINARY DRIVE MAXIPOWER DRIVE

In most Maxipower installations, fewer belts and smaller diameter sheaves are used, center distances are shorter. Costs can be cut up to 30%, valuable space is saved. Sheaves have narrower grooves and groove spacing, are smaller, less costly. The smallest sheaves that can safely be used with the drive motor can be installed. Often these will be 50% smaller than present drives. This reduced sheave weight and face width means less shaft overhang, less bearing load—increased bearing life.

The extra strength of Maxipower V belts comes from its new rubber compounds, the tough fibers used in its load-carrying cords, and the new "deep V" design. Because of this design the belt's load-carrying cords are supported so completely that each has an equal share in the load—none "loaf".

All Maxipower V belts are heat-resisting, oil-resisting at no extra cost. Belts with static conducting properties can also be ordered *at no extra cost.*

For further information and help in selecting Maxipower belts for your drives, call your B.F.Goodrich distributor. *B.F.Goodrich Industrial Products Company, Dept. M-759, Akron 18, Ohio.*

B.F.Goodrich V belts

Costs go down with Armco Casing

HERE'S HOW:

There are three basic reasons why Armco Casing means lower costs, greater efficiency.

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The fast, easy-to-make downhand fillet weld required with Armco Casing keeps field welding costs low. Just stab one end of a 40- or 50-foot joint into the Armco Slip-Joint Collar, make a fast weld and lower away.

Low casing costs

High collapse resistance of Armco Casing is uniform throughout, which means you can safely set lighter, lower cost strings to greater depths. Tests have proved that the variation in collapse pressure for Armco Casing is less than for other types of casing.

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Armco Casing, supplied in exact 40- or 50-foot lengths, eliminates the usual random or double-random lengths. Because of fewer joints in the string, you get faster running, lower costs. And uniform lengths help you quickly determine the footage in the hole or in the stockpile at any time.

New steels are born at Armco

Armco Casing is distributed by National Tank Company from the 26 stocking points listed at right. Sizes range from 6 to 24 inches. Write us for complete information. Armco Drainage & Metal Products, Inc., 4440 Curtis Street, Middletown, Ohio.

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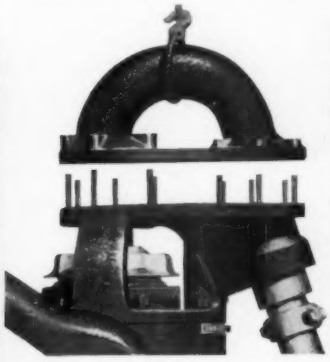
brighten up your profit picture with quick trips . . less trouble . . long life

Right up to the minute streamline design provides the proper balance for Continental-Emsco straight and fast-falling MA and RA series blocks . . low center of gravity design increases working height in the mast . . lets block ride higher in the mast for greater clearance at derrick floor. Reversible cartridge allows lubrication of sheave bearings from either side.

HERE'S WHERE YOU GAIN EXTRA RUNNING MILES FROM WIRE ROPE

Note the flame-hardened surface of the sheave grooves. This keeps their surface smooth and long wearing . . no scored surface to cut and shorten wire line life.

Continental-Emsco L series swivels are made to handle the high mud pressures of today's drilling . . and yet are light enough not to bend the kelly in its rat hole. They are short with ample hook clearance and are simple in design for quick . . easy maintenance.



ROTARY HOSE IS NOT DISTURBED WHEN REPLACING PACKING OR WASH PIPE

This design feature cuts down-time, since rotary hose does not have to be disconnected to change packing or wash pipe . . packing is a one-piece unit which also speeds-up replacement.

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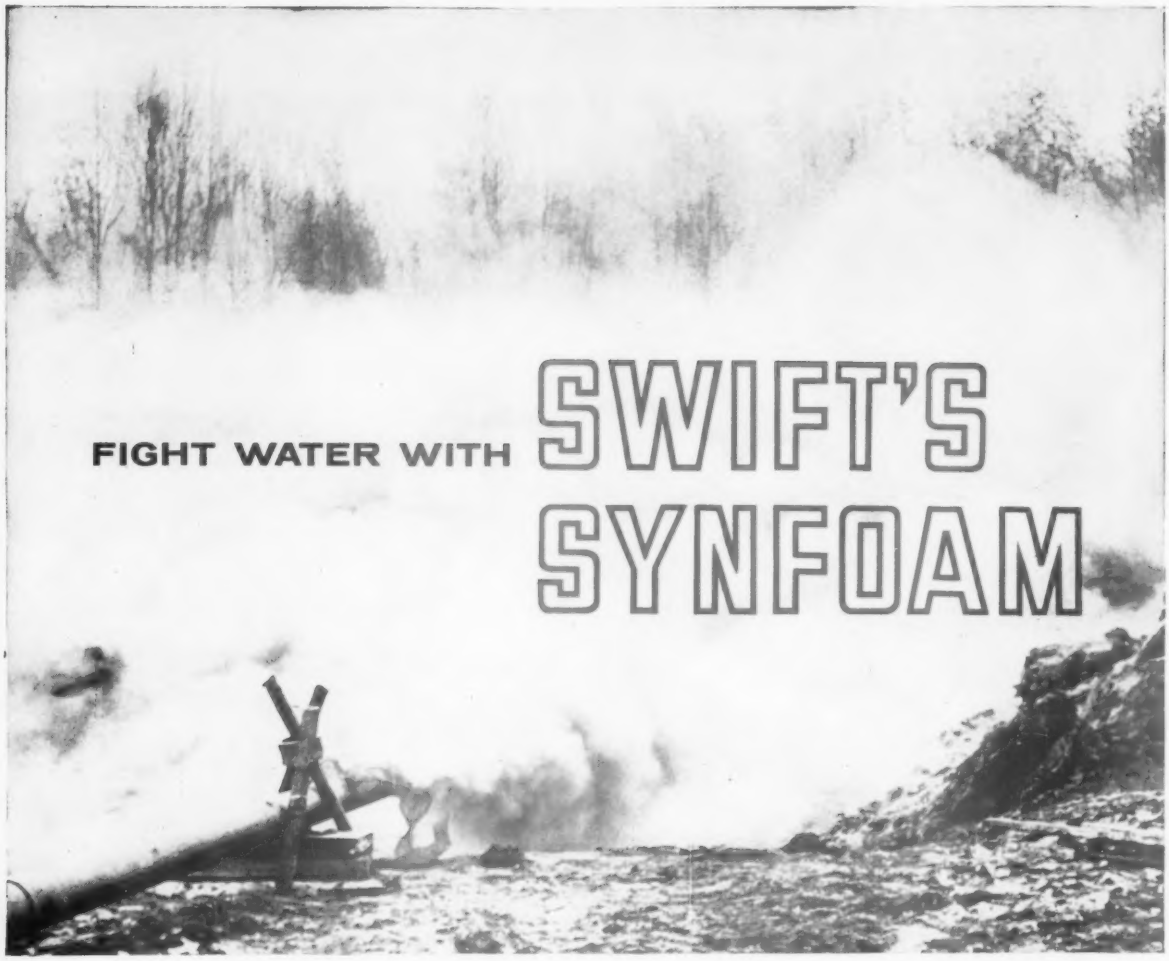

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Swift

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S-60

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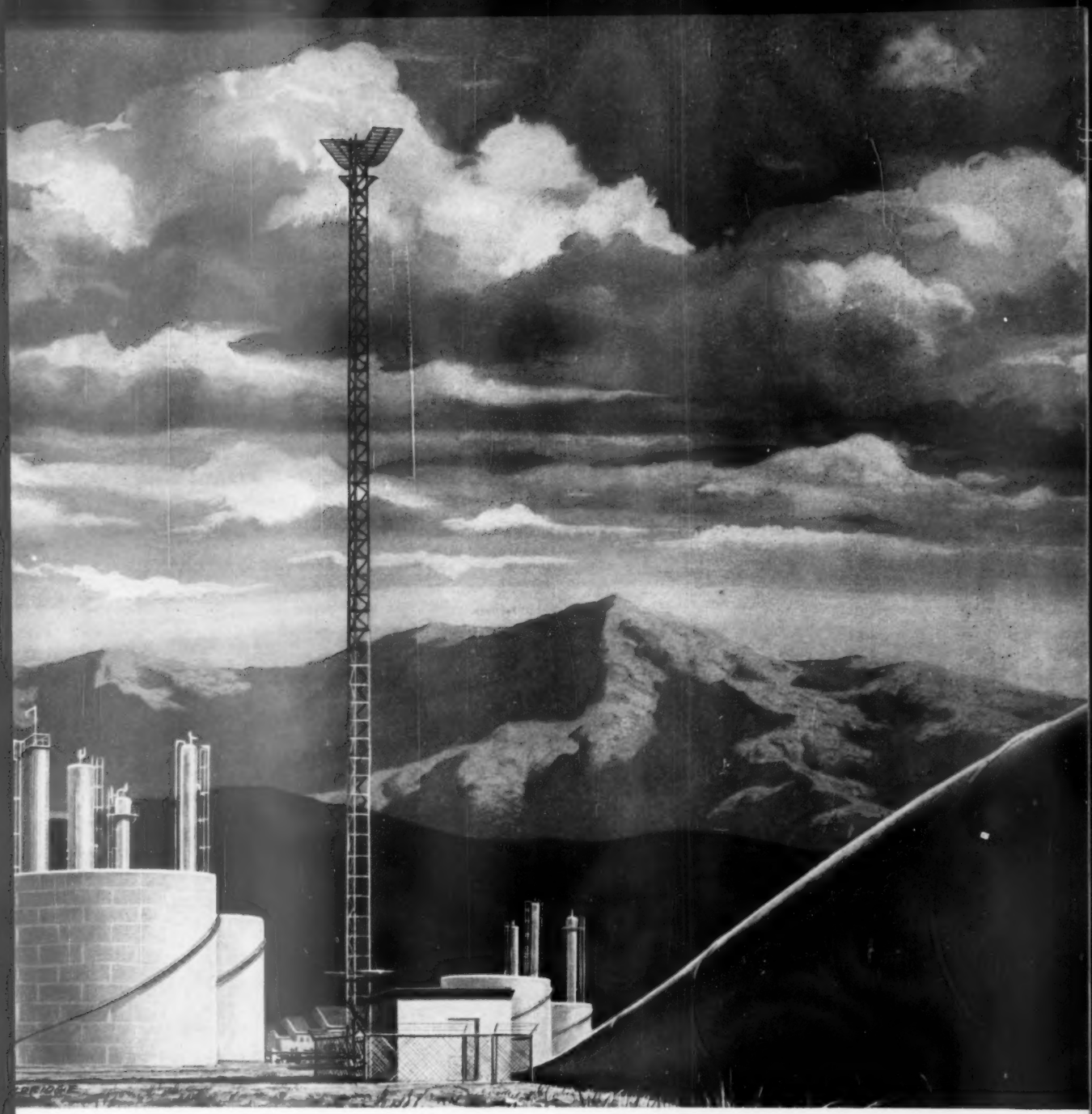
COLORADO:	NEW MEXICO:	OKLAHOMA:	TEXAS:	TEXAS:	WEST VIRGINIA:	CANADA
Denver 8	Farmington	Oklahoma City	Houston 24	Midland	Charleston 22	ALBERTA: Calgary
Well Completions, Inc.	Well Completions, Inc.	Well Completions, Inc.	Drill-Kem, Inc.	Technical Drilling	McJunkin Corporation	Well Site Air
P. O. Box 578	P. O. Box 2012	34101 S. Eastern	1525 S. North	Service, Inc.	P. O. Box 513	Services, Ltd.
			Post Oak Road	P. O. Box 1518		P. O. Box 144



COLLINS MICROWAVE AND CARRIER

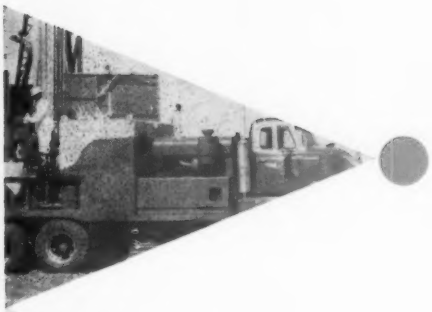
Reliable communication for forward-thinking pipeliners

Collins leadership in the field of communication makes the organization uniquely qualified to supply your complete "turn-key" microwave system — consultant service, planning, siting, equipment design and manufacture, installation, training and field service. Take advantage of this worldwide experience in providing the finest communication service. Consult Collins for your private system, tailored to your individual requirements. Your microwave system will be reliable, flexible and readily adaptable to tomorrow's expansion.

COLLINS

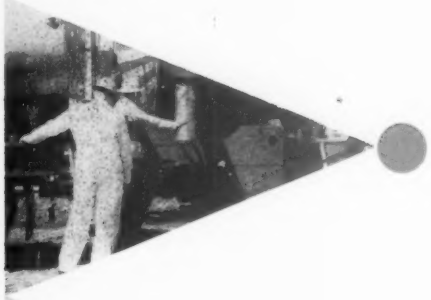
COLLINS RADIO COMPANY • DALLAS, TEXAS • CEDAR RAPIDS, IOWA • BURBANK, CALIFORNIA

What makes HALLIBURTON *Cementing better?*



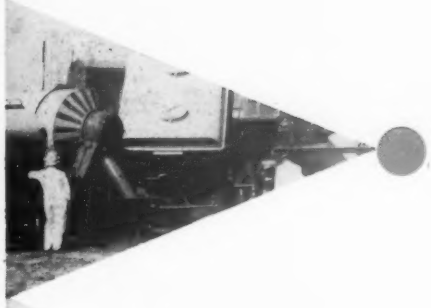
EQUIPMENT

Halliburton oil well cementing equipment is designed and manufactured for utmost service and maximum efficiency under oil field conditions. Halliburton cementing equipment—and tools—are carefully engineered to permit selections meeting individual well requirements.



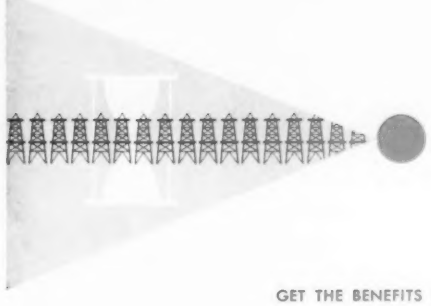
PERSONNEL

No mechanism—whether a giant cementing unit or a compact down-hole cementing tool—is better than the man who operates it. Halliburton cementing personnel are not just workmen... they are skilled specialists, carefully trained and thoroughly experienced in the effective use of oil well cementing tools and equipment... Behind all Halliburton field personnel is the research staff that includes world leaders in oil well chemistry, mechanics and hydraulics.



MATERIALS

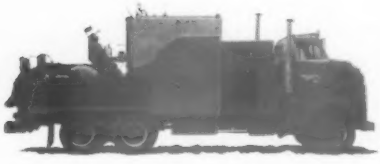
Bulk cementing, pioneered by Halliburton, has proven its value to oilfield operators. Halliburton cementing materials, including special additives for specific well requirements, make for better cementing results.



EXPERIENCE

Cementing oil wells has been a Halliburton specialty for more than 35 years and experience gained from over 2,000,000 jobs ranks the company as a leader in service to the Petroleum Industry.

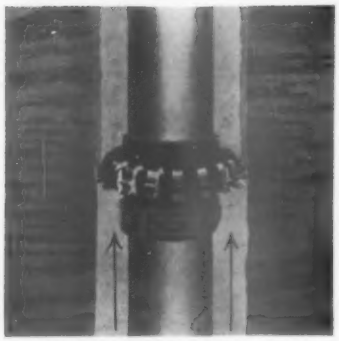
GET THE BENEFITS OF BETTER CEMENTING IN YOUR WELLS. GET HALLIBURTON.



HALLIBURTON

OIL WELL CEMENTING COMPANY

DUNCAN, OKLAHOMA



Recipo Wall Cleaner Installed with EZ Lok Limit Clamp

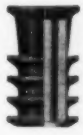
RECIPO WALL CLEANER

The wide, tough rubber cleaning fingers of this Halliburton tool more effectively remove undesirable filter or mud cake from the bore hole to allow better bonding of cement. Cement properly bonded to the wall of the hole and casing gives protection to both and usually lengthens the producing life of the well.

CEMENTING PLUGS

The two-plug method using Halliburton's type 5W top and bottom cementing plugs reduces contamination on the interface between mud and cement... Gives better cementing results around bottom of casing where a good bond is required.

5-Wiper Plug — Top



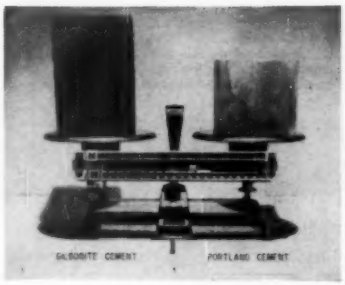
5-Wiper Plug — Bottom

THESE HALLIBURTON PRODUCTS HELP MAKE HALLIBURTON CEMENTING SUPERIOR

GILSONITE CEMENT

Typical of many Halliburton cements and additives is Gilsonite, a light weight, low density additive which adds volume to the cement slurry without adding weight. Its graded particle size offers superior bridging characteristics for better control of lost circulation.

The illustration demonstrates the low-density characteristic of Gilsonite cement. Balancing on the scale are one and one-half cubes of 10.0 pound-per-gallon Gilsonite slurry and only one cube of portland cement made from 15.6 ppg slurry.



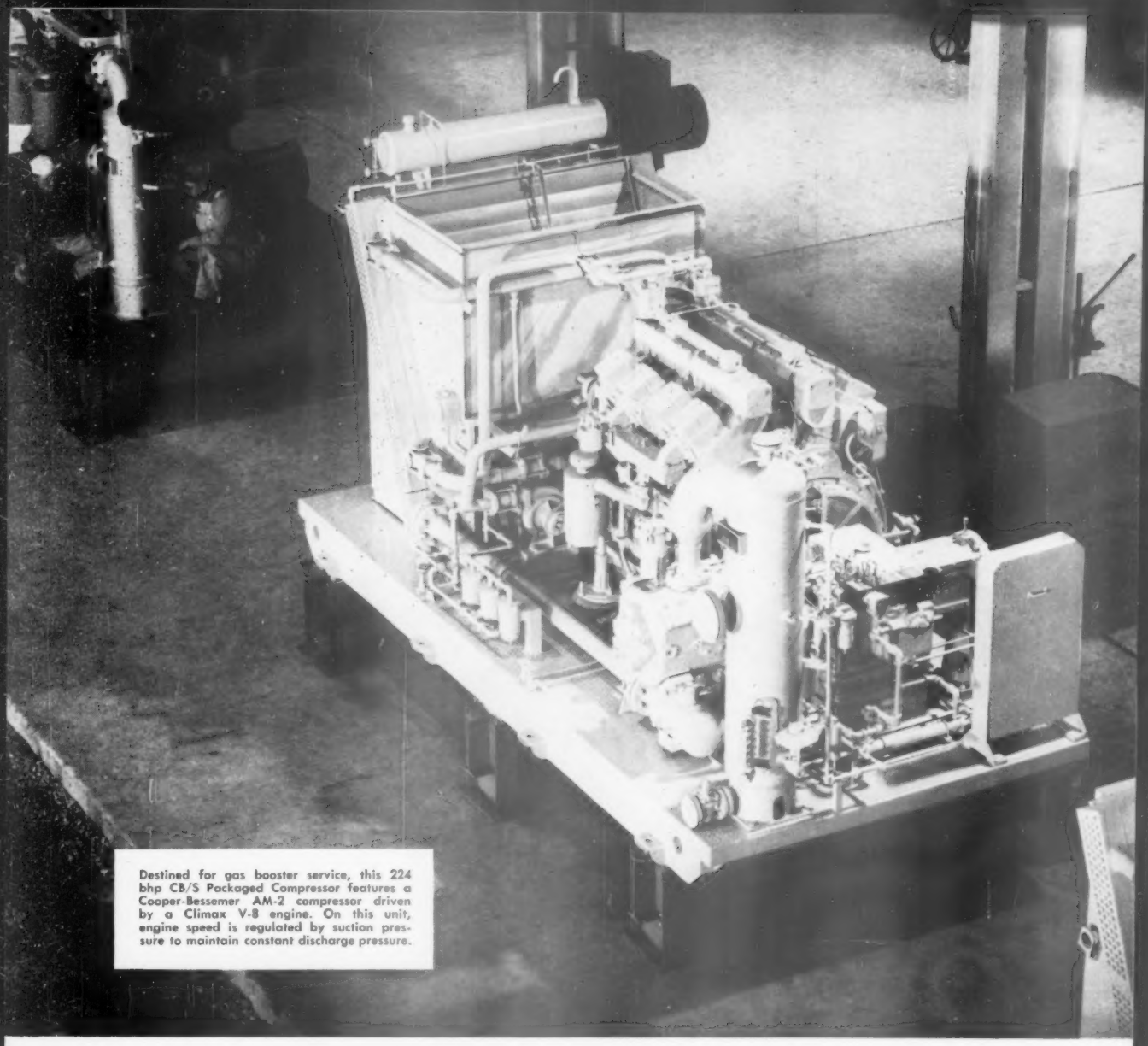
S-3 CASING CENTRALIZER

Provides positive centering force to permit more uniform centering around the pipe for maximum strength and minimum cement channeling. Aids in increasing the economical life of the producing formation.

S-3 Casing Centralizer

284 SERVICE CENTERS . . . JUST MINUTES AWAY FROM YOUR WELL

CEMENTING SERVICES



Destined for gas booster service, this 224 bhp CB/S Packaged Compressor features a Cooper-Bessemer AM-2 compressor driven by a Climax V-8 engine. On this unit, engine speed is regulated by suction pressure to maintain constant discharge pressure.

Building packaged compressors is our business . . . our only business. This single objective is the reason CB/S Packaged Compressors are more advanced in design . . . more efficient in the field.

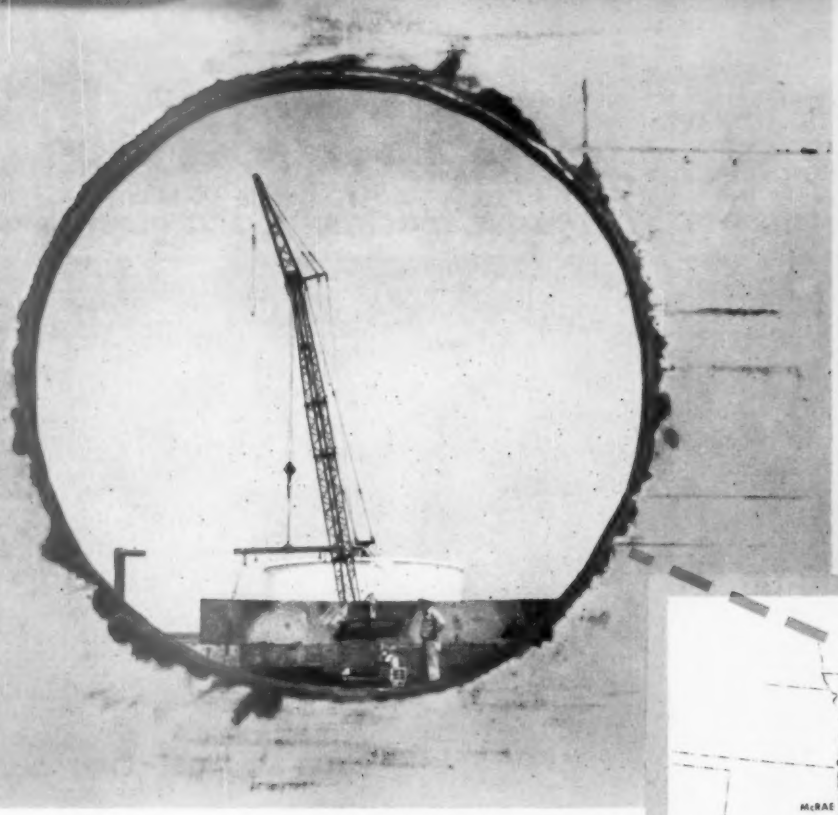
CB/S

PACKAGED COMPRESSORS

CB/S

C-B SOUTHERN, INC., P. O. BOX 19267, HOUSTON 24, TEXAS

A subsidiary of The Cooper-Bessemer Corporation.



View of CB&I at work made through manway cutout in gasoline storage tank under construction for Texas Eastern at Seymour, Indiana.

P88CB

CB&I TANKS serve Little Big Inch System

After 11 years of natural gas transmission service, Texas Eastern's Little Big Inch pipeline is once more delivering refined petroleum products from Beaumont to the Midwest.

At key locations along the system, CB&I built more than 50 storage tanks during the reconversion of Little Big Inch. These facilities increased the system's storage capacity by more than 4 million barrels.

When *you* need storage tanks or process equipment, profit by learning more about CB&I's experienced and coordinated engineering, fabrication and erection services. Your inquiry is invited.

Cone roof storage tank above is one of more than 50 storage structures . . . including Horton Floating Roof tanks . . . built by CB&I along the Little Big Inch pipeline.

CHICAGO BRIDGE & IRON COMPANY

CBI

332 SOUTH MICHIGAN AVENUE
CHICAGO 4, ILLINOIS

OFFICES AND SUBSIDIARIES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

Naugatuck KRALASTIC

RUSTPROOF, CORROSIONPROOF, LIGHTWEIGHT, TOUGH, SNAKEABLE PLASTIC PIPE

and it joins with a brush!

No need for expensive threading operations and wrench work—no time wasted—Kralastic pipe can be joined in *seconds* by *anyone!*

Just paint mating surfaces of Kralastic pipe and fitting with a special solvent or cement—slip them together and allow them time to set, and you have made a connection as durable as the pipe itself!

And Kralastic *is* durable!

It can't rust or rot, is permanently free of electrolytic corrosion. It's unharmed by soil acids, natural gas, most chemicals. And because it's one of the toughest of all plastic materials, it resists damage from tools, rocks, and rough handling.

What's more, Kralastic pipe is flexible enough to follow uneven ground contours without costly, job-prolonging fittings. And it's easily cut with an ordinary hacksaw.

This tough rubber-resin material—one of the first to produce successful plastic pipe—has proved itself not only in natural gas lines, oil field pipe, and electrical conduit for home and industry, but in hundreds of other *tough* applications including water transmission lines.

Better investigate Kralastic™ pipe and learn more of its *many* advantages. Write today to the address below.

US RUBBER

United States Rubber

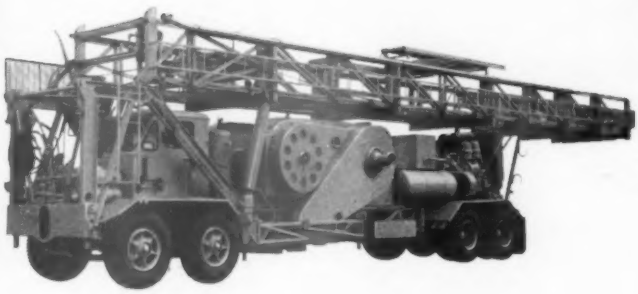
Naugatuck Chemical Division 116 K Elm Street Naugatuck, Connecticut

Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices

DIST. OFFICES: Akron • Boston • Gastonia • Chicago • Los Angeles • Memphis • New York • Phila. • **CANADA:** Naugatuck Chemicals, Elmira, Ont. • **CABLE:** Rubexport, N.Y.

CARDWELL'S KM210
SLASHES INCREASING COSTS
that steal your profits—by cutting servicing and workover costs where it counts: On the road! In the field! At the hole!

EASE THE SQUEEZE ON PROFITS!



This new Cardwell Drive-in Unit is outstanding for time and cost saving features! Designed for competitive servicing in the 7,000 to 12,000 foot range with 2½-inch tubing, the KM210 lets you set the pace competitively . . . and still make a profit. This rugged, well-integrated unit **1** offers fast, easy-handling roading characteristics **2** cuts moving-in and rig-up time drastically, and **3** gets YOU more work because it saves actual performance time once in position and working!

TODAY'S FINEST HOIST! ✻ Unusually large brakes ✻ High-capacity main drum clutch, outboard-mounted, for minimum maintenance ✻ All Chain drives fully enclosed . . . and oil-flood lubricated for long life ✻ Rugged, Cardwell-designed off-hiway carrier.

Write today for full information. Request Bulletin No. 3-5-59

cardwell

Cardwell Manufacturing Company, Box 2001, Wichita, Kansas · Cable: ALLSTEEL · Phone AMherst 7-3311

"We wouldn't use any other valve!"

W-K-M® Oil Field Valves

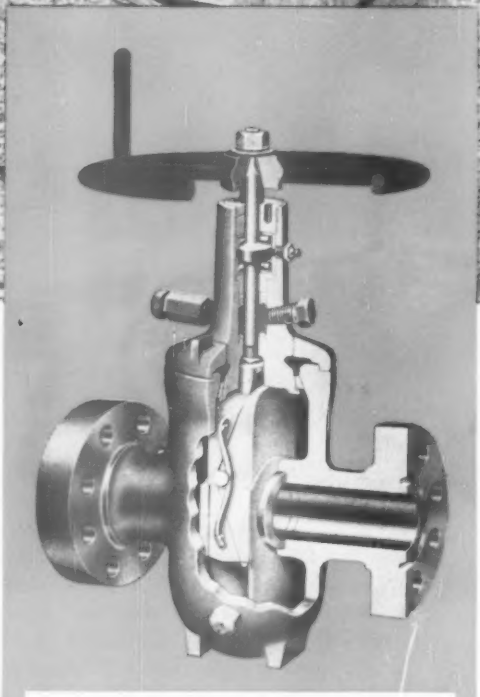
No other valves give the same dependable service and lifetime economy. No other valves seal so tight.

W-K-M's Controlled Force Seating creates an initial bubble-tight seal between the gate and Teflon inserts. As the gate assembly expands, a tight metal-to-metal seal is achieved. Result: a perfect *Double Tight Seal* without body or seat lubrication.

Next time—and every time—specify W-K-M! *Available at leading supply stores everywhere.*

PRODUCT OF W-K-M's *Creative Engineering*

WRITE FOR CATALOG 200



W-K-M Through-Conduit Gate Valves feature pressure seal bonnets, superfinished stems supported on roller bearings, seating surfaces sealed from the lading flow — and can be overhauled on-the-line.

Sizes: 2", 2½", 3" and 4".

Working Pressures: 1000-5000 psi (model illustrated above); other models 500 to 15,000 psi.

W-K-M

DIVISION OF ACF INDUSTRIES INCORPORATED

P. O. BOX 2117, HOUSTON, TEXAS

5917-R

OFF AGAIN ON AGAIN SAVE AGAIN

with Unibestos reusable pipe insulation

Why is Unibestos worth more at competitive prices than other insulations? One California refinery required removal and replacement of Unibestos insulation from a 24-inch line TWICE A MONTH FOR FIVE YEARS! Naturally, these people now use Unibestos exclusively.

Everywhere . . . in refineries, power plants, process industries . . . once Unibestos is put to work, we have a steady customer. All we ask is a chance to show *you* how Unibestos can be constantly and effectively reused; how it resists impact and rough handling; eliminates shrinkage; defies thermal shock, fumes, acids and moisture; cuts application time and costs; and guarantees real insulating efficiency. Only Unibestos is made from the exceptionally long fibers of tough ***Amosite*** asbestos.

Available in full range of standard pipe sizes and in block form. Single thickness to five inches. Specials to 44" O.D.

Write today, on your letterhead, for Bulletin No. 65610.

UNIBESTOS AFTER 25 REUSES

Unretouched photograph of typical sections of Unibestos pipe insulation after 25 reuses. Rugged qualities of Unibestos make reuse on changed lines or test lines standard operating procedure under all types of conditions.

UNIBESTOS

worth more, yet sold at competitive prices

UNARCO®

UNARCO PRODUCTS

• UNIBESTOS, Amosite Asbestos Pipe Covering and Block • Calcium Silicate Pipe Covering and Block • 85% Magnesia Pipe Covering and Block • Mineral Fiber Block • Wrap-On Insulation • Lace-On Insulation • Turbine Blankets • Insulating and Finishing Cements • Asbestos Textiles • Packing and Gasketing.

UNION ASBESTOS AND RUBBER COMPANY • FIBROUS PRODUCTS DIVISION

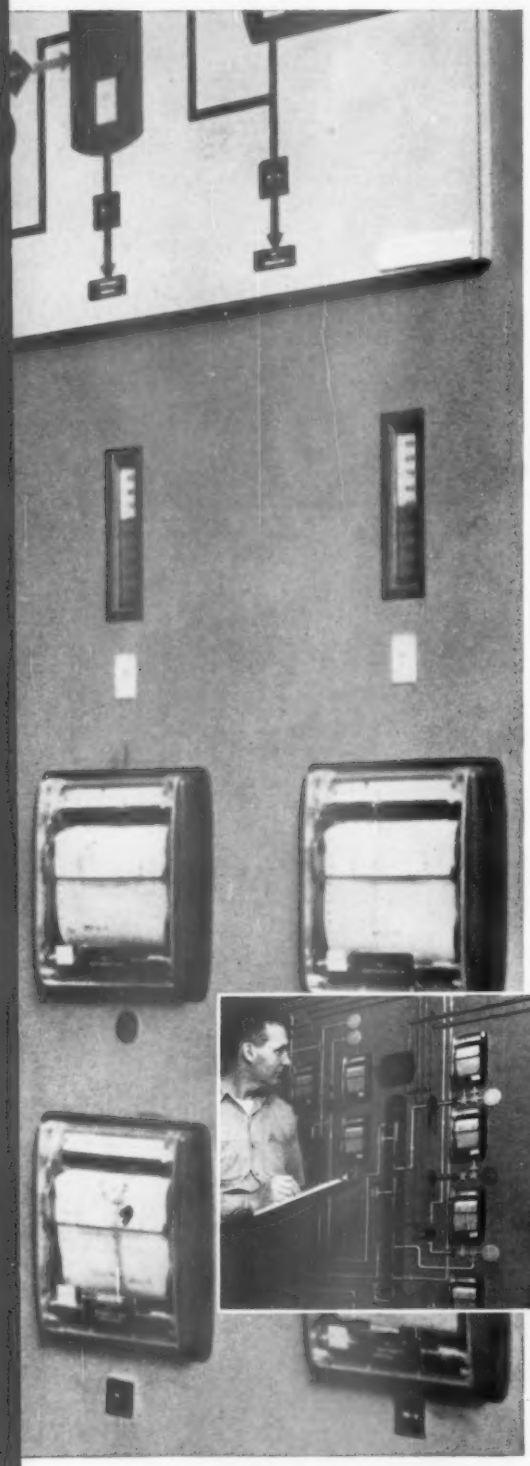
DEPT. 235, Bloomington, Illinois

Esso looks to

Consotrol Control panel for Powerformer* at Esso's Bayway Refinery, Linden, New Jersey. Complete Consotrol Control Station slides out from front of panel as a unit — makes servicing easier for Esso technicians.

*Trade mark, Esso Standard Oil Company

Consotrol* instruments



for dependable control at their Bayway Refinery

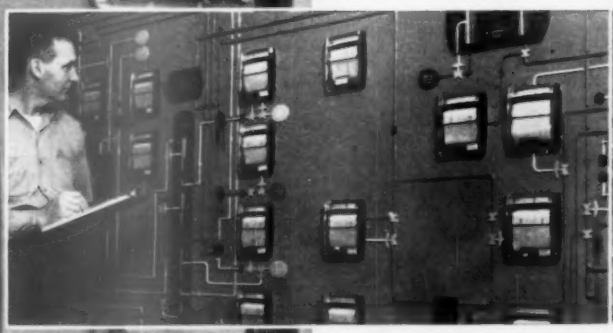
Precise, dependable, centralized control . . . full-scale, easy-to-read chart records . . . simplified maintenance from the front of the panel. No wonder leading refineries like Esso specify Foxboro pneumatic Consotrol instrumentation.

Consotrol control stations are so compact, four can fit where one circular chart instrument used to go. Yet recorders still have a full-scale, 4-inch chart — can furnish continuous recording of up to 3 different variables on the same chart.

Consotrol M/58 Controllers handle a full-range of control functions: auto-selector . . . cascade and ratio systems . . . automatic batch control.

Get the complete story on pneumatic Consotrol instrumentation by writing for Bulletin 13-18. **The Foxboro Company, 601 Neponset Ave., Foxboro, Mass.**

*Reg. U.S. Pat. Off.



▲ Foxboro control panel for #6 Pipe Still was installed in 1952. Consotrol recorders have a full-scale 4" chart which travels vertically. Pen arm moves in an arc — eliminates extra linkage common to instruments that must convert rotary motion to straight-line pen travel.

▲ This hydrofiner full-graphic panel includes 54 Consotrol Recorders, 44 Controllers. Ethylene Plant control panel (not shown) includes another 100 Foxboro Pneumatic Consotrol instruments.

FOXBORO

REG. U.S. PAT. OFF

MAGCOBAR TECHNOLOGY
cuts the cost of drilling. At Magcobar, drilling mud is a scientifically designed combination of chemicals engineered to meet your drilling conditions as they occur and to result in the lowest possible over-all drilling cost. And with Magcobar you get the right drilling chemicals *used right*—backed by chemists, reservoir engineers, and laboratory facilities. All of this . . .

HELPS OPERATORS
with drilling fluids that reduce or prevent damage to the pay. Often, completions are quicker, production higher, and there is less need for expensive stimulation work. Because of Magcobar's advances in drilling mud technology, today's wells are worth more to the operator and cost less to produce than similar wells only a few years back. But Magcobar also . . .

HELPS CONTRACTORS
to cut total drilling costs by using the right mud products *right*. Magcobar products and engineering in partnership with the contractor result in faster drilling, greater safety, and a more profitable operation. Magcobar technology helps by reducing friction to increase the life of mud pump parts, reducing torque, swivel wear, load on chains, rotaries, drive system, and engines. Helps . . .

TO MAKE FASTER PENETRATION
to cut the cost per foot of drilling. Faster penetration means savings in bits, fewer round trips, and fewer operating hours. But the problem of fast drilling is only partially one of chemicals. That is why more and more drillers call Magcobar engineers before starting. This combination of Magcobar products and planned engineering means faster drilling, greater safety, and higher profits.

Here's how Magcobar cuts drilling costs around the world...

T-8®
compound is a one-package additive which builds and maintains a shale control mud. Proper use results in lower mud cost, greater hole stability, and more uniform properties.

BIT LUBE
is a slightly viscous, oily fluid which gives to drilling fluids many of the properties of an extreme pressure lubricant. Bit Lube protects bit bearings, to increase bit life, and reduces hole friction, resulting in faster penetration with fewer round trips.

MAGCONATE
is a powerful emulsifier for oil-in-water emulsions. It allows the use of higher bit weights without balling problems. It forms a very tight emulsion, making for lower filtration loss and a reduction in surface tension of the filtrate.

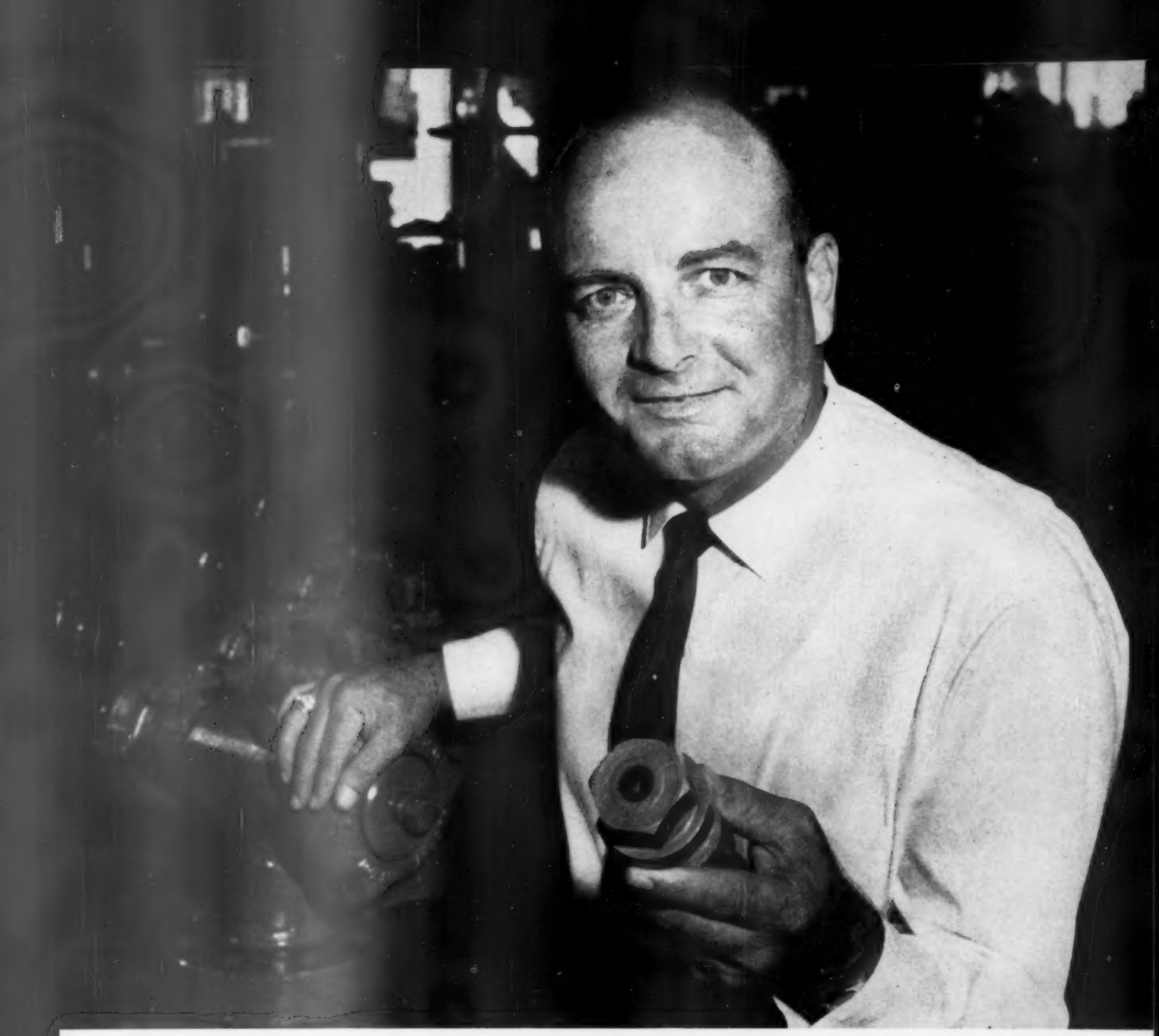
Magcobar
Complete
DRILLING MUD SERVICE

Magnet Cove Barium Corporation
Houston, Texas, U.S.A.

SPERSENE
a chemically modified lignosulfonate, is a highly effective thinner in gyp, lime, and salty muds. It is readily soluble in fresh or salt waters. It lowers viscosity more effectively, at less cost, than many of today's leading thinners.

LEATHER-FLOC®
is a tiny clinging type of fiber that has the greatest sealing capacity against seepage losses of any lost circulation material. It will improve or tighten a seal where a bridge has been established by coarser materials. It improves the seal of loose, large particles.

WELL DONE WITH MAGCOBAR TECHNOLOGY



This bean lasts for the flowing life of a well!

Low cost, renewable inserts take the cutting action

With ordinary care, a single UNIBOLT Master Bean will last for the entire flowing life of a well. These beans are threaded to receive an inexpensive screw insert. The cutting action of sand-laden production is imposed on the expendable insert, not the master bean.

The inserts are not only inexpensive, they are easier to change than regular beans. Drilled in increments of 5% and 10% of well flow, as well as in increments of 1/64th inch, these inserts provide the versatile range of an adjustable choke with the fine accuracy of a positive orifice.

This is only one of a number of refinements in flow bean design perfected and introduced by UNIBOLT. Others are: shaped entrance to reduce turbulence and maintain flow accuracy, "flow-rating" as a standard inspection procedure to insure correct orifice sizing, and special analysis alloys and heat-treatments for corrosion and wear resistance.

UNIBOLT flow beans are designed to fit only UNIBOLT Positive Choke Bodies and Cage Nipples.

Request UNIBOLT Positive Choke Bodies and Cage Nipples from your Christmas tree supplier and be assured of the finest in dependable flow control.

Unibolt screw inserts are easy to change, and they protect the master bean against cutting.

UNIBOLT

THORNHILL CRAVER CO.

P. O. Box 1184, Houston, Texas

DECISION:

NO DANGER OF BURN-THROUGH when the line pipe is Republic Electric Resistance Weld. Made from prime, flat-rolled steel. Checked for quality and uniformity as *only* flat-rolled steel can be checked. You get easier bending in field or shop . . . faster line-up of joints . . . better field welds. Mail coupon for details.

EASY WORKABILITY is a characteristic of Republic Continuous But. Weld Pipe. Uniform strength and ductility assure fast, trouble-free threading . . . excellent, in-service dependability. Tight galvanized coating resists corrosion. Sizes range from ⅛" through 4" nominal. Available in double random lengths. Send for information.

X-TRU-COAT

ARIZONA PUBLIC SERVICE COMPANY IS USING 110 MILES OF THIS PLASTIC-COATED, CORROSION-PROOF PIPE!

With X-TRU-COAT, corrosion will be sealed out *permanently, before* delivery, at *lowest* overall cost. That was the decision of the Arizona Public Service Company, Phoenix, Arizona. They are using *110.7 miles* of this polyethylene-coated pipe in a project designed around company-owned and -serviced irrigation pumps. The project will save farmers as much as 11% yearly on power costs. They will be relieved of excessive investment... pay only for horsepower delivered to the pump shaft.

Anything *but* an ordinary product, Republic X-TRU-COAT merits your investigation. Learn how its tough yet flexible coating wards off electrolytic action... is immune to the most severe acid or alkaline soil... stands up under the abuse of shipping, loading, trucking, and handling. Your Republic distributor has complete information. Call him today or mail the coupon.

INSTALL WITH CONFIDENCE! The product of a corporation with more than 50 years of pipe-making experience, Republic SRK Plastic Pipe has the high degree of quality essential in severe corrosion applications. Republic has the know-how and facilities — works full-time — to bring you plastic pipe that performs better, longer, at lowest possible cost.

REPUBLIC STEEL

WORLD'S WIDEST RANGE
OF STANDARD STEELS AND STEEL PRODUCTS

REPUBLIC STEEL CORPORATION
DEPT. OG-8301
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send more information:

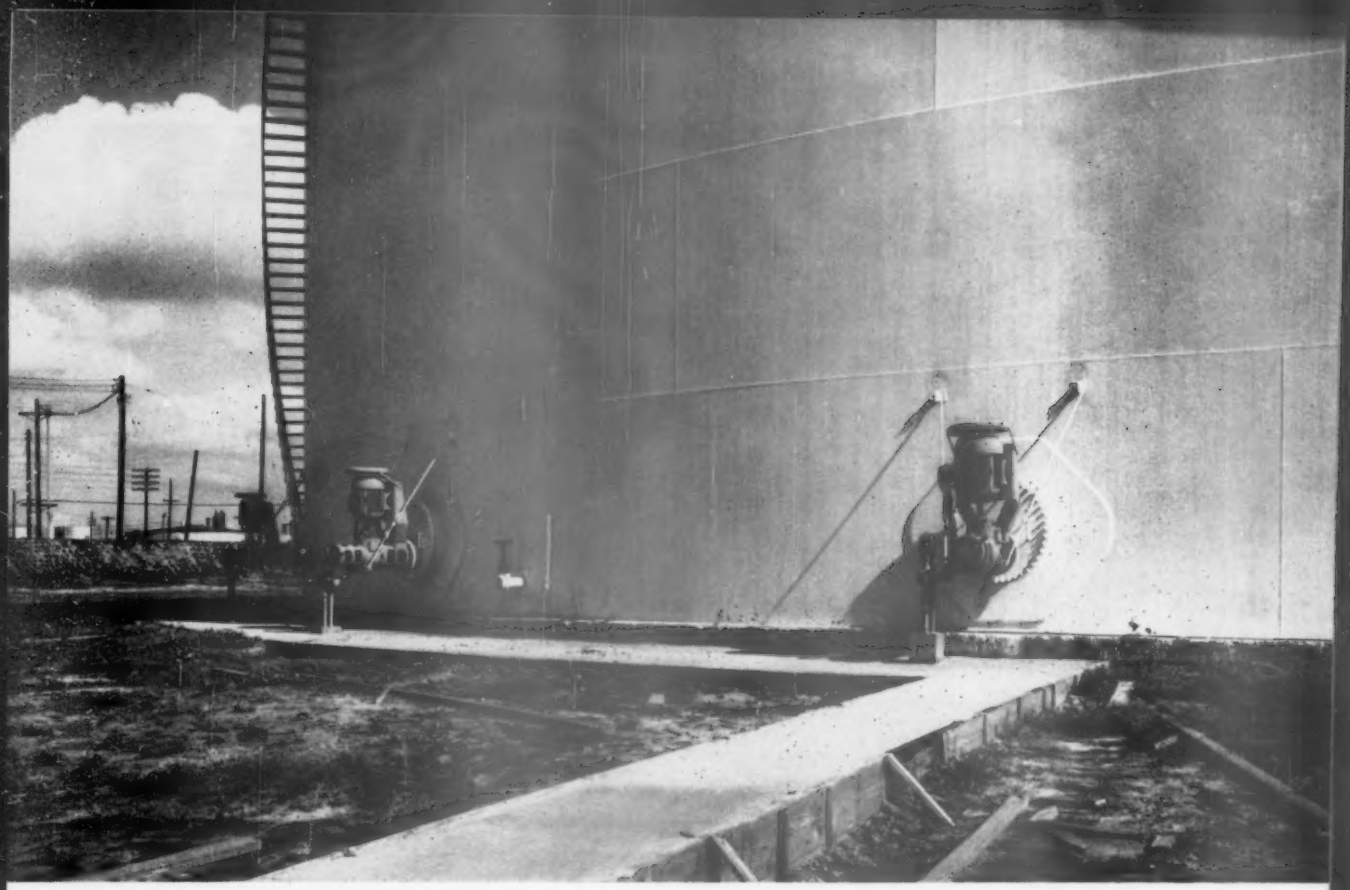
- ☐ X-TRU-COAT Plastic-Coated Steel Pipe
- ☐ Electric Resistance Weld Line Pipe
- ☐ Semi-Rigid (SRK) Plastic Pipe
- ☐ Continuous Butt Weld Pipe

Name _____ Title _____

Firm _____

Address _____

City _____ Zone ____ State _____



How they keep crude from **stacking up like pancakes**

Surging into this tank come crudes from wells scattered over 23 counties.

Out of the tank comes *one* crude, at the right gravity to feed to refineries more than 450 miles away.

For the men who run the tank farm, it's no chore at all to blend 122,000 barrels of crudes ranging from less than 20° to above 85° in gravity. They do it by flipping three switches.

The LIGHTNIN Mixers you see here do the rest. While the tank is filling, and for two or three hours before it goes on suction, the mixers create a powerful, steady turnover that breaks up stratification from the bottom up. The outgoing tender of crude stays within a degree or two of constant gravity.

Control BS&W, too. That's not all. These mixers help keep sludge from settling on the tank bottom and stealing valuable storage space. They keep the tank working at its full capacity.

Multiply these savings by the number of tanks at this farm equipped with LIGHTNIN Mixers—and you can see why more than 50 pipeline companies and 35 leading oil companies use this easy way to keep operating costs in line.

How about you? If you'd like to see how LIGHTNIN Mixers on your big tanks can save you as much as $1000 per tank per year, call in your LIGHTNIN representative. He's listed in Composite Catalog. Or write us today.

YOU CAN ADD as much as 12% extra storage capacity to your tank farm—by using LIGHTNIN Mixers to keep tanks free of space-eating sludge. Mixing results are unconditionally guaranteed.

Lightnin® Mixers

MIXCO fluid mixing specialists

Get these helpful bulletins on BS&W control and LIGHTNIN Mixers. Check, tear out and mail to us today with your name and company address. Free—no obligation.

- ☐ BS&W Control with LIGHTNIN Mixers (B-503)
- ☐ Side-entering mixers, 1 to 25 hp (B-104)
- ☐ Data sheet for figuring mixer requirements (B-107)
- ☐ Condensed catalog describing LIGHTNIN Mixers—all types (B-109)
- ☐ LIGHTNIN rotary mechanical seals to eliminate stuffing-box maintenance (B-111)

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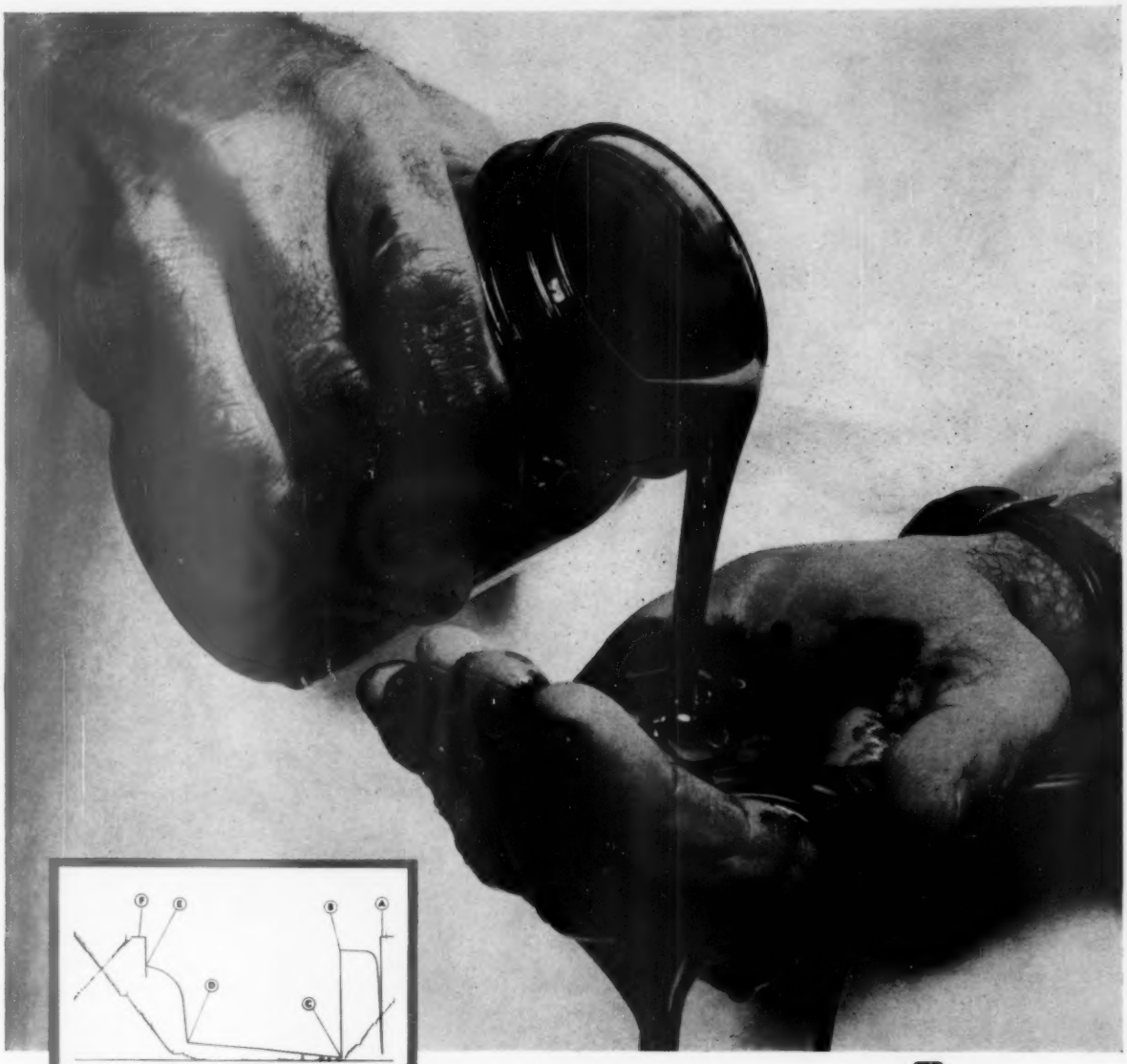
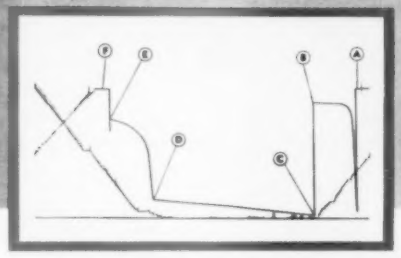
In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Ave., Toronto 19, Ont.





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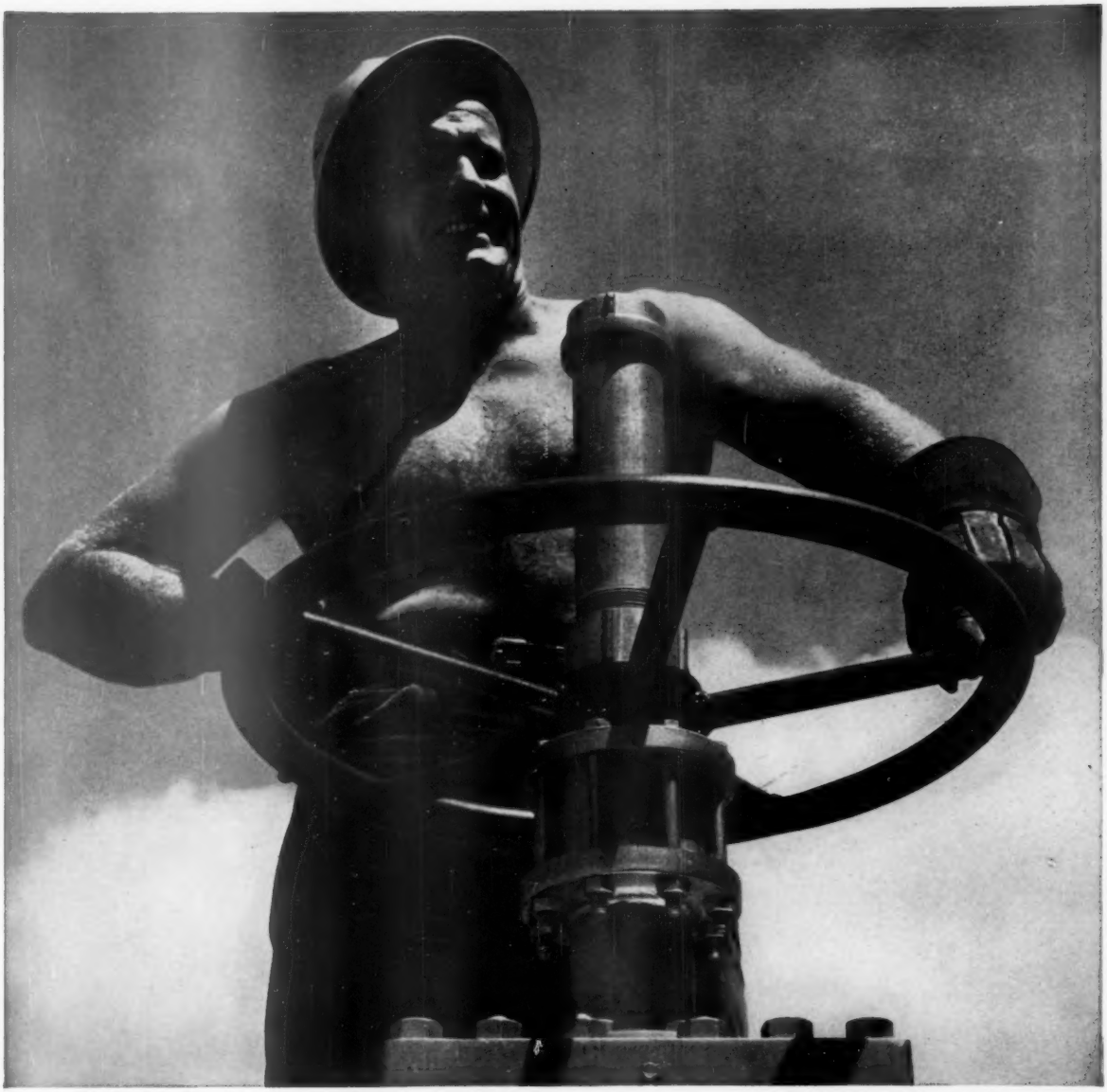

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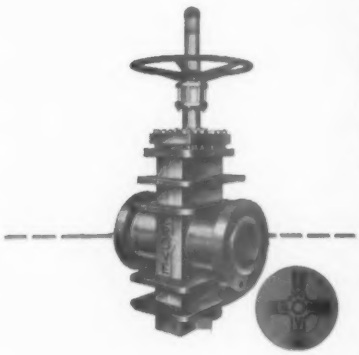

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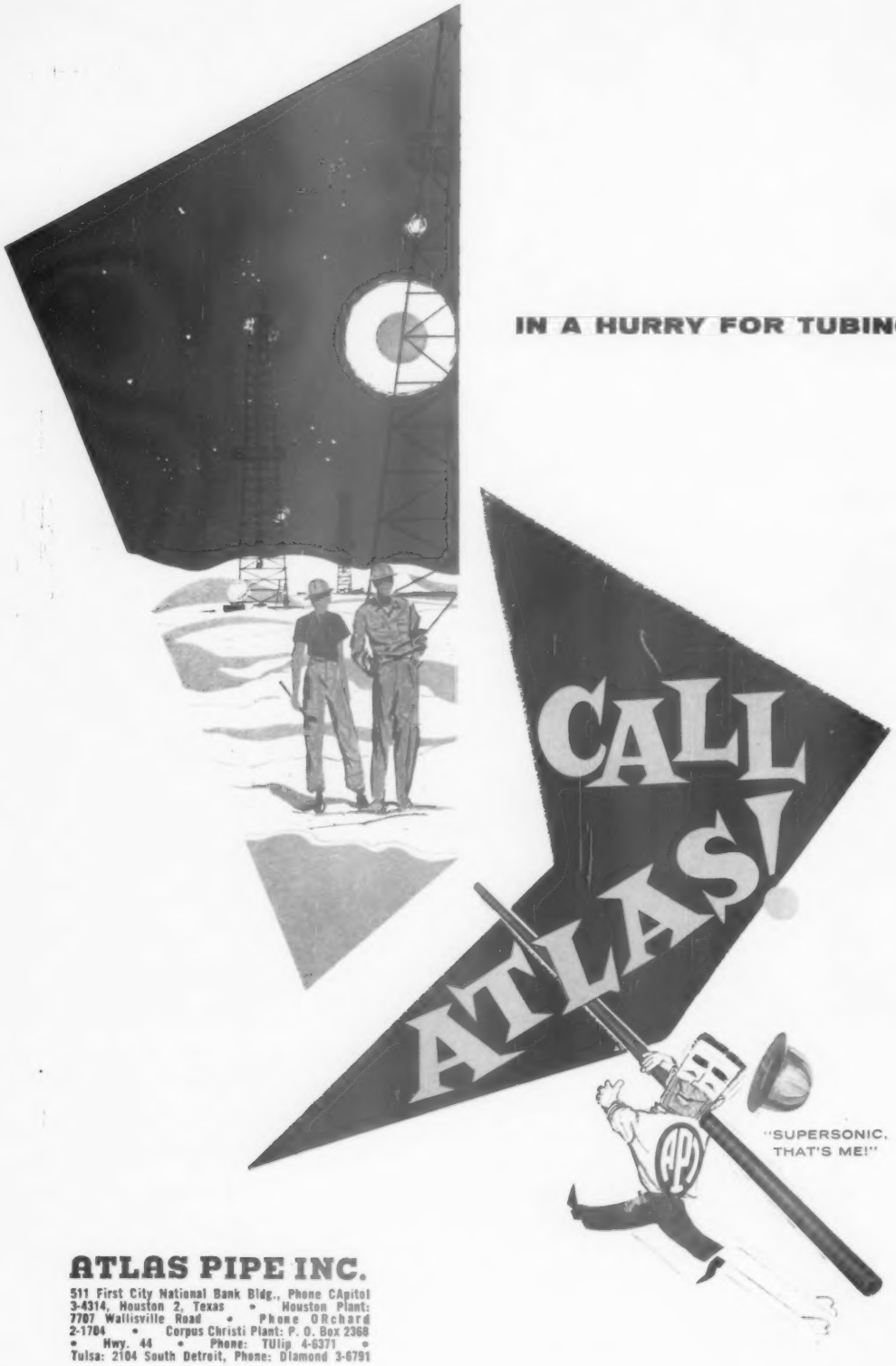

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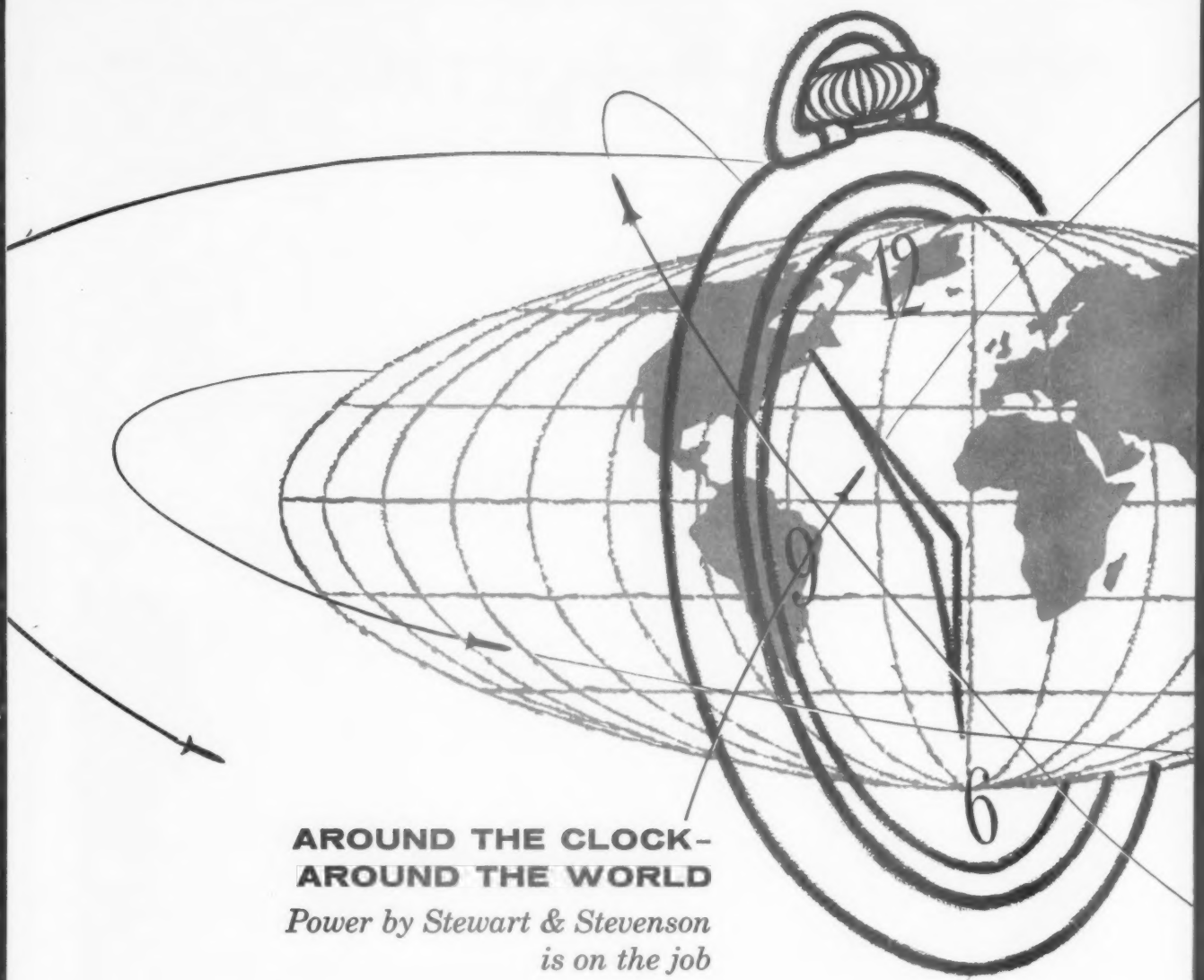

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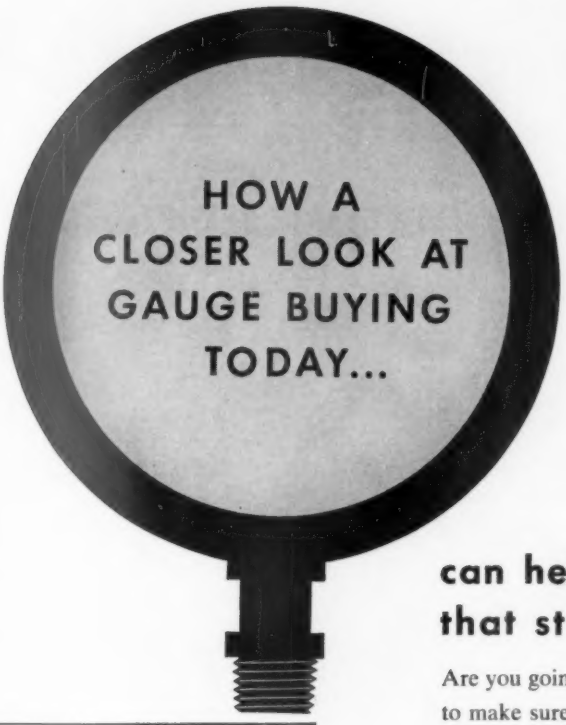

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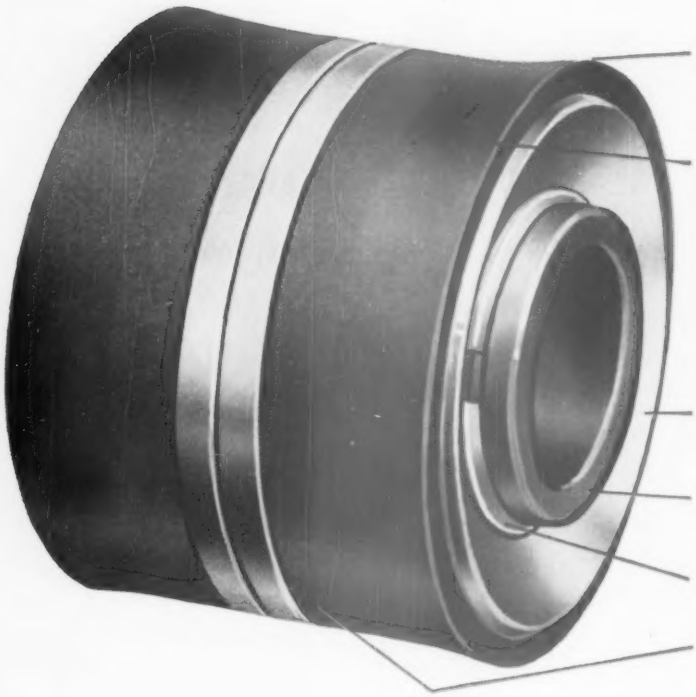

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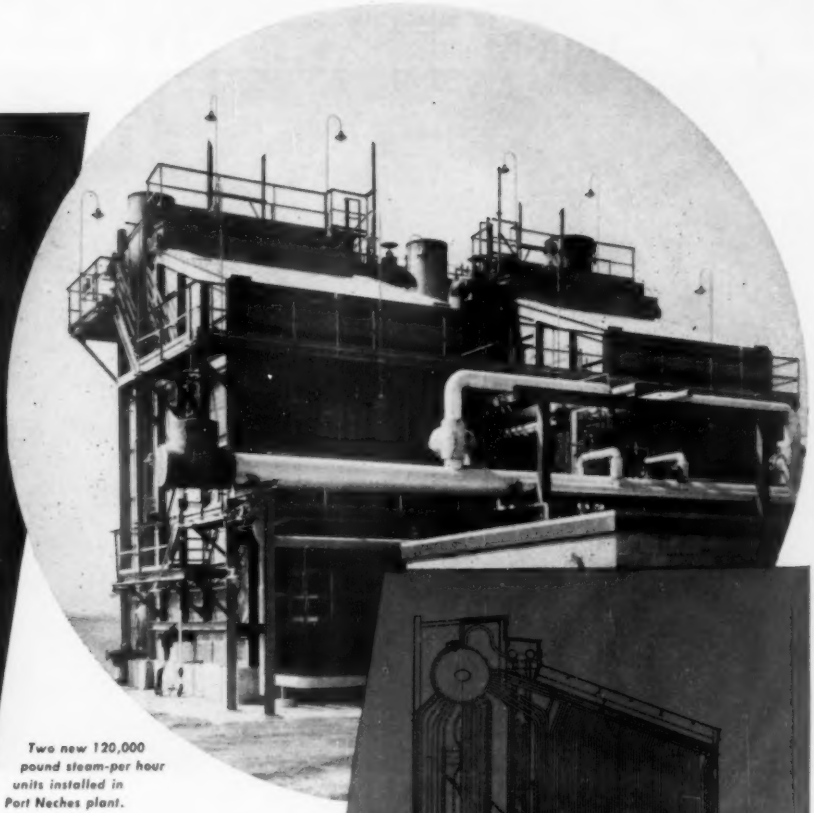
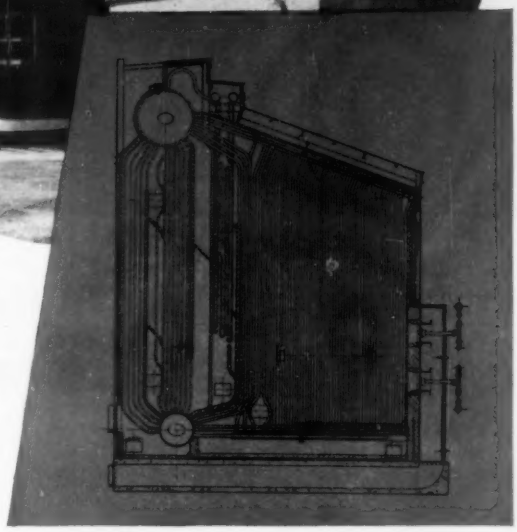
Steam for Jefferson Chemical by Vogt



Two new 120,000 pound steam-per hour units installed in Port Neches plant.



The needed additional power and process steam capacity for Jefferson Chemical's expanded Port Neches plant is furnished by the two Vogt boilers pictured here, each with a capacity of 120,000 pounds per hour. The boilers are designed for 675 lbs. pressure to operate at 625 lbs. pressure and 769°F. total temperature. The furnaces are equipped with gas burners and have water cooled front and side walls.

Bulletins describing Vogt boiler installations in a variety of industrial plants for power, processing and heating are available on request.

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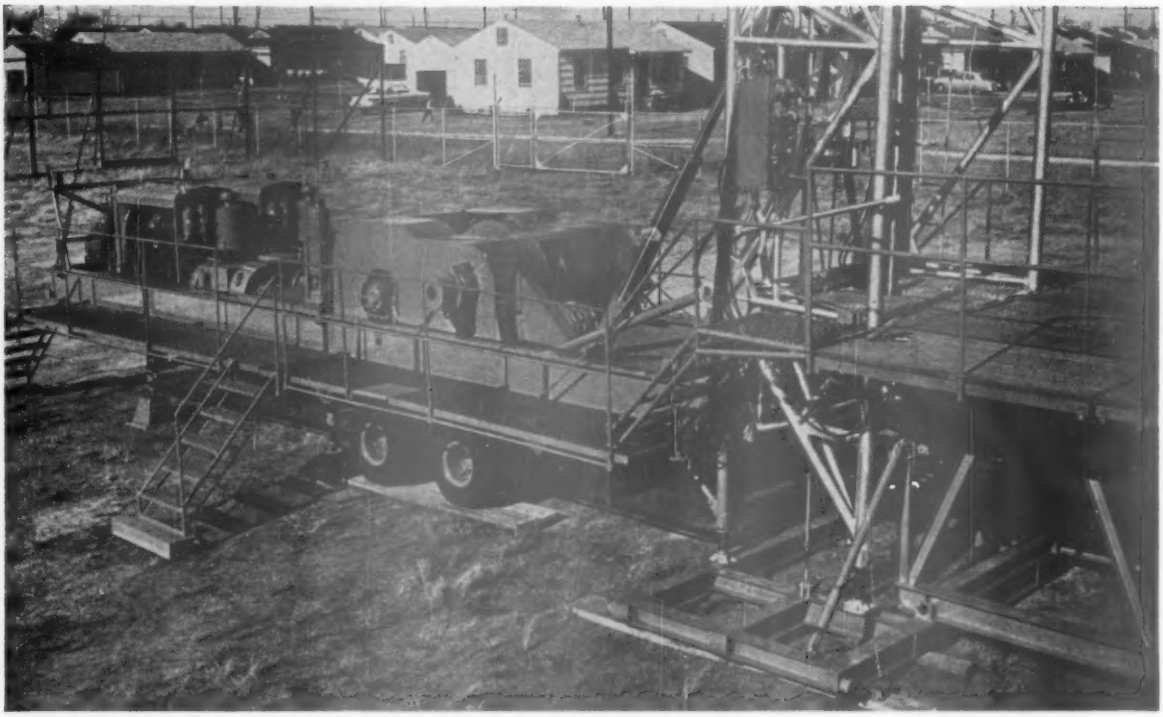

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They Say—

Against registration

Dear Sir:

Excellent article, "How Geologists Feel About Registration," (OGJ, Jan. 4, p. 52).

We must definitely kill any idea of political licensing for one special reason (there are many reasons).

Geologists range far and wide geographically, finding it necessary to cross state lines indiscriminately. Geology does not conform to geography! Imagine the chaotic situation in geography in the Four Corners area of Colorado, New Mexico, Utah, and Arizona, or the scrambled egg pattern of Texas and Oklahoma Panhandles, with neighboring New Mexico, Kansas, and Colorado.

Professional reform must come within, not from without. One idea is to cancel out the 4-year degree in geology, making the first professional degree of competence a master's degree. The 4-year degree is no longer recognized by industry as being of any real value.

Geology must expand in the direction of the geosciences (earth sciences) which means only master's and doctor of philosophy degrees can merit any professional respect.

Maury M. Travis
Denver.

Christmas giving

Dear Sir:

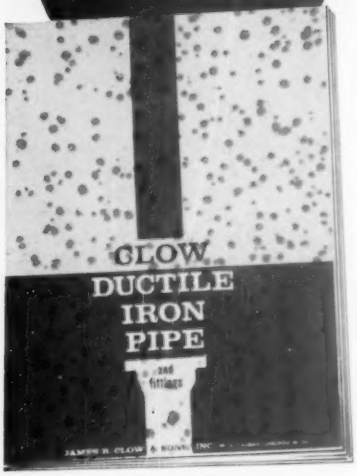
Many thinks for your fine Journally Speaking, "Visions of Sugar Plums" (OGJ, Dec. 21, p. 39).

I am happy to say that suppliers, contractors, and producers connected with oil exploration have found a solution to the Christmas gift problem in the SEG Foundation. It was the "out of hand" status of industrial giving, plus the "thou shalt not" attitude of management that gave birth to this foundation 4 years ago.

A leading manufacturer of shothole rigs told one of his customers at lunch one day that his Christmas gift purchases would exceed $3,000 that year. He said that he doubted any good will was created by these gifts, in fact, he figured he was making e n e m i e s faster than friends (he couldn't g i v e everybody a copper-bottomed charcoal broiler). But he was caught. He couldn't just stop giving.

His customer suggested giving the

This new book will help solve your CORROSION PROBLEM



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$3,000 to charity. This seemed a good solution, but let's face it, a supplier needs closer identity with the industry he serves, and there wasn't much to connect the "Blank Boy's Home" with oil exploration.

Then came the light. Why not use the $3,000 to help a deserving young person through a college course in exploration geophysics? Let an unbiased organization choose the recipient to avoid any taint of favoritism. He picked the SEG for the task. A scholarship committee was formed, and the first SEG scholarship was established in 1956.

In 1958 the SEG Foundation was chartered and in 1959 a total of $25,000 was awarded to 29 students from funds contributed by 44 companies and individuals. The contributions ranged from $5.00 to $3,750. The 22 major contributors included 10 suppliers, 7 geophysical contractors, 4 producing companies, and 1 independent foundation. The general fund contributors included 10 suppliers, 5 consulting geophysicists, 4 geophysical contractors, and 3 individual SEG members.

It is significant that the SEG foundation scholarship program was developed during a period of major adjustment in oil exploration when advertising budgets were being curtailed. This fact strengthens our belief that the motives of our sponsors are not entirely mercenary. They have found in this one avenue both an opportunity to build good will for themselves and a way to contribute to the advancement of science.

Colin Campbell
Business Manager
Society of Exploration
Geophysicists

In defense of Compact

Dear Sir:

I have noted the editorial on page 41 of your December 21 issue on "Conservation Progress: an Exercise in Futility," and I think you have been unduly severe in your criticism of the Interstate Oil Compact Commission.

I particularly object to the statement: "At the Philadelphia meeting everybody had a good time but nobody did anything constructive." I don't propose to speak for other committees of the compact but for the secondary recovery and pressure maintenance committee, of which I am chairman, I can say that we had one of our best technical programs in the history of the committee.

This program did not deal with "past achievements," as you say, but rather was devoted to a study of methods whereby the recovery of oil could be improved from Pennsylvania fields.

The greatest strength of the Compact lies in its lack of compulsory powers. If it had attempted to compel the correction of some of the problems you have mentioned, I feel sure a Congress and the Attorney General would find ways to cause it to desist from such activities and perhaps abolish the Compact completely.

Again referring to the work of the committee which I have the honor to head, I want to point out that our program is a continuing one in which we are endeavoring to advise state officials about new methods and techniques which will add to the resources of the respective states, which they will be called on to regulate, and which they should be able to regulate more intelligently because of the expert information they have received.

I call attention specially to the consideration we have given to the use of carbon dioxide, to high-pressure gas injection, to miscible phase displacement, to thermal recovery; also to special consideration we give to oil-recovery problems in states where meetings are held.

In addition, the work we are doing on unit and cooperative projects, on effects of curtailment of production on recovery from water-flood projects, and our evaluation of U. S. oil resources is of significant importance, as evidenced by the eagerness with which you and other trade magazines publish our findings.

Personally, I am very much aware of the importance of the problem you have discussed of containing excess producing capacity. This problem did receive consideration at Philadelphia in a statement presented by the president of Oklahoma Independent Petroleum Association, and it is my understanding that it will receive consideration at the first meeting of the executive committee in 1960.

I have a feeling that your editorial may serve a useful purpose in calling attention to the urgency of this problem, and to that extent, it is constructive. However, I feel that it is inaccurate when it is inferred that no consideration had been given to the problem and that nothing of a constructive nature was accomplished at Philadelphia.

Paul D. Torrey
Petroleum Engineer
and Geologist
Austin, Tex.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

JANUARY

11-13 Alberta Society of Petroleum Geologists, first international symposium on Arctic geology, Hotel Palliser and Jubilee Auditorium, Calgary.

11-15 Society of Automotive Engineers, annual meeting, Sheraton-Cadillac Hotel, Detroit.

15-16 Association of Oilwell Servicing Contractors, annual meeting, Baker Hotel, Dallas.

17-19 Kansas Oil Men's Association, annual convention, Broadview Hotel, Wichita.

18-20 Kentucky Petroleum Marketers Association, annual meeting and convention, Brown Hotel, Louisville.

22 Natural Gasoline Association of America, Gulf Coast regional meeting, Robert Driscoll Hotel, Corpus Christi, Tex.

25-28 Plant Maintenance and Engineering Show, produced by Clapp & Poliak, Inc., Convention Hall, Philadelphia

27-28 Western Petroleum Refiners Association, Gulf Coast regional technical-industrial relations meeting, White Plaza Hotel, Corpus Christi, Tex.

31-Feb. 3 Pipe Line Contractors Association, annual meeting, Ambassador Hotel, Los Angeles.

FEBRUARY

1-4 Instrument Society of America, instrument-automation conference and exhibit, Rice Hotel and Houston Coliseum, Houston.

8 Alberta Division of Canadian Petroleum Association, annual meeting, Hotel Palliser, Calgary.

7-10 American Association of Petroleum Geologists, Rocky Mountain section annual meeting, Billings, Mont.

14-18 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Statler-Hilton and McAlpin hotels, New York.

21-24 American Institute of Chemical Engineers, meeting, Biltmore Hotel, Atlanta.

24-25 Wisconsin Petroleum Association, annual convention and exhibit, Schroeder Hotel, Milwaukee.

24-26 National Association of Corrosion Engineers, Tulsa section, eleventh annual corrosion short course, Mayo Hotel, Tulsa.

26 Natural Gasoline Association of America, Permian Basin regional meeting, Lincoln Hotel, Odessa, Tex.

26 Ohio Oil and Gas Association, winter meeting, Deshler-Hilton Hotel, Columbus, Ohio.

MARCH

2-4 American Petroleum Institute, Division of Production, southwestern district meeting, Statler-Hilton Hotel, Dallas.

6-9 American Society of Mechanical Engineers, gas turbine power and hydraulic conference, Rice Hotel, Houston.

7 Canadian Petroleum Association, annual general meeting, Hotel Palliser, Calgary.

7-8 University of Florida, annual heat transfer symposium, Engineering and Industries Building, Gainesville, Fla.

14-18 National Association of Corrosion Engineers, sixteenth annual meeting, Memorial Auditorium, Dallas.

16 Petroleum Equipment Suppliers Association, eastern district membership meeting, Duquesne Club, Pittsburgh.

16-18 American Petroleum Institute, Division of Production, southern district meeting, Hilton Hotel, San Antonio.

18 Natural Gasoline Association of America, Oklahoma regional meeting, Biltmore Hotel, Oklahoma City.

21-23 Midwest Gas Association, annual meeting, Hotel St. Paul, St. Paul.

22 Petroleum Equipment Suppliers Association, Gulf Coast district membership meeting, Shamrock Hilton Hotel, Houston.

24-25 New England Gas Association, annual meeting, Hotel Statler-Hilton, Boston.

28-30 Western Petroleum Refiners Association forty-eighth annual meeting, Hilton Hotel, San Antonio, Tex.

29-31 American Power Conference, annual meeting, Sherman Hotel, Chicago.

30-Apr. 1 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Broadview Hotel, Wichita.

APRIL

3-8 Engineers Joint Council, sixth nuclear congress, New York.

4-7 Oil Heat Institute of America, annual convention, Park-Sheraton Hotel, New York.

4-7 National oil heat and air-conditioning exposition, Coliseum, New York.

5 Petroleum Equipment Suppliers Association, southern mid-continent district membership meeting, Statler Hilton Hotel, Dallas.

5-7 Instrument Society of America, national chemical and petroleum instrumentation symposium, Rochester, N. Y.

7-8 Rocky Mountain Oil and Gas Association, midyear meeting, Newhouse Hotel, Salt Lake City.

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SINCE 1895

1959 has been a paradoxical year. With the public press reporting good business for the country as a whole, it has taken a discerning student to discover that the part of the economy relating to capital goods has only bettered to a modest degree. This fact, plus the low carryover of orders from 1958, caused us to have an unhappy year financially.

However, with the modest but positive increase in business in the U.S.A. and the substantial increase in orders for most of our overseas areas, we look forward with confidence to 1960. Improvement of efficiencies in all internal departments has also been positive and is continuing both as to costs and the time it takes to do things. This naturally will be beneficial to our customers.

SUGAR — Orders from new and expanding cane sugar factories in India for RapiDorr Clarifiers and Oliver-Campbell Filters contributed significantly to the business of our subsidiary in that country. And in other locations around the world—Mexico, British Honduras, Egypt, Mozambique and Swaziland, for example — these two units continued to be accepted as standard in the industry. In beet sugar, a British producer purchased First Carbonation Thickeners and Vacuum Filters for two new mills; and two Italian mills will use a total of four Vacuum Filters.

PETROLEUM—A variation of the initial application of the DorrClone Desanding System in fresh water treatment is the desanding of salt water used to recharge wells for secondary oil recovery at a West Coast location. Outside the U.S. our Japanese representative is fabricating filters for use in a catalytic cracking process and our British company will supply oil-water separators for both British and Brazilian refineries. Also of interest is equipment for a pilot plant to recover oil from tar sands.

PROJECT ENGINEERING — This phase of our operations was also particularly active in 1959 as design of phosphoric acid plants to be located in Idaho, Great Britain and Ireland and a phosphoric acid and triple superphosphate installation for Brazil was commenced. Also in the fertilizer field was a contract for process modification of a large British plant.

Late in the year, work was started on design of a large limestone crushing plant for which D-O will also purchase equipment and other materials. Our French subsidiary and domestic company working jointly virtually completed design of a large Yugoslavian copper concentrator. Two smaller but nonetheless significant projects—both including laboratory testing and feasibility studies — involved production of a limestone substitute to be used for self-fluxing sinter in blast furnace operation and the recovery of nickel from waste pickle liquors.

FLUOSOLIDS SYSTEMS — One of the new applications of the FluoSolids system this year has been preheating coarse shale in a special three-compartment reactor to produce light-weight aggregate. A second is drying iron ore before magnetic separation and concentration. Currently, the iron ore industry appears to have other drying applications ideally suited to fluidization. FluoSolids roasters are also under construction for a Canadian smelter where only partial sulfur removal is required.

Projects involving already proven applications have included in 1959 a pyrite roaster for a sulfuric acid plant on Formosa, three systems marketed by our Italian subsidiary for roasting pyrite to produce sulfur dioxide for pulp mill bisulfite cooking liquor and for a large zinc roasting installation in Yugoslavia, a large coal dryer for a Western producer, a copper-cobalt roaster in the Belgian Congo and detergent dryers in the United States.

METALLURGICAL — As in past years our work in this area has involved virtually all of the metallic minerals from gold to iron ore. The latter field as been among the most active with purchase of Sizers and Filters for Canadian washing plants, DorrClone classifiers for desliming prior to flotation, and Thickeners, Filters and Pumps for recovery of blast furnace flue dust.

PULP AND PAPER—A new tool for this industry is a novel pressure washing filter. Installation of the first U.S. manufactured unit is being made in a Southeastern pulp mill. Ideally suited to brownstock washing, the unit has a number of advantages from both the operating and installation standpoints.

Recausticizing systems including process flowsheet innovations, such as precoat operation of the Lime Mud Filter and application of a two-compartment White Liquor Clarifier with special feedwell, were purchased for new or expanding mills in Canada, India, the United States, Portugal, Japan, Yugoslavia, Scandinavia and the Philippines.

Around the world the American Saveall continued to be recognized as the major means of recovering paper machine fibers from white water and in the U.S. the largest bleach tower designed to date will soon go into operation. An unusual and interesting application of the Merco Centrifuge is recovery of by-product material used as a drill mud dispersant at a West Coast mill.

CHEMICAL — During the year applications of the Plastic Filter, first introduced in mid-'58, were broadened to include a variety of fine chemical and pharmaceutical separations and washing of acid leach liquors from metallurgical pulps. Also in the realm of new applications is dewatering of various plastics using the Mercone Screening Centrifuge.

As usual, our standard line of equipment played a major role in a great number of Italian chemical plant expansions and in large new or expanded facilities in France, Germany, Spain, Mexico and here at home.

FOOD PRODUCTS — Successful application in 1958 of the Mercone-Precoat Filter combination for apple juice processing has resulted in orders from two West Coast packers for similar stations.

In starch, several domestic and overseas producers will employ D-O Centrifugals of virtually every design for current modernization and process modification projects. Our Dutch subsidiary has put into operation three corn and potato starch washing and processing plants in Germany and Finland.

We have noticed with much concern the apparent growing tendency of many users of services and equipment to buy almost exclusively on price rather than on demonstrated product quality and the essential engineering services made available to them during planning and after installation. This is not a new subject — and one on which there has been much forceful editorial comment in the technical press.

This practice confronts the supplier with the practical short range choice of sacrificing product quality and needed engineering, losing the business, or taking it at a loss. For our own part, we do not propose to fall into this trap which, economic considerations aside, can only result in arresting technological advance and which could have a profound effect on the leadership of the free world in things technical.

J. D. Hitch, Jr.
Chairman of the Board

December 1, 1959

50 years ago

January 6, 1910

Officials of Oklahoma Natural Gas Co. belittle fears of public that supply of natural gas in Oklahoma soon will be exhausted by heavy drafts to be made on it from outside the state. They say that in addition to those now producing, the company has capped wells waiting market outlet that could flow more than a billion cubic feet of gas daily.

Coalinga takes lead among California's San Joaquin Valley fields with year's oil production passing 15,000,000 bbl. Big flows from Kern River, McKittrick, Midway, and Maricopa fields boost valley's total output above 38,500,000 bbl. for year, greatest in history.

25 years ago

January 10, 1935

Superior Oil Co.'s 1 Martinez in Bosco field on Acadia-St. Landry parish line in South Louisiana becomes first 10,000-ft. well on Gulf Coast. Drilled to 10,002 ft. it is 135 ft. deeper than previous depth record of 9,867 ft. set by Yount Lee Oil Co. well in Chambers County, Texas.

Representatives of governors of eight states in conference at Ponca City, Okla., vote to form Interstate Oil Compact and petition Congress for legislation for its authorization. Charter states represented include Texas, Louisiana, Kansas, Oklahoma, California, Illinois, Arkansas, and New Mexico.

Supreme Court decision in famous Amazon Petroleum Corp.-Panama Refining Co. case invalidates Section 9 (c) of National Recovery Act prohibiting interstate and foreign shipments of oil produced in excess of state allowables.

10 years ago

January 12, 1950

Unique history recalled as Standard Oil Co. (Ohio) celebrates eightieth anniversary of its founding. Twice in its lifetime, the company has run the complete cycle from a small independent to a large integrated company.

Supreme Court upholds jurisdiction of Federal Power Commission over intrastate pipeline companies distributing gas coming from other states. Decision climaxes 10-year argument between FPC and East Ohio Gas Co. Forty similar cases pending.

Operators of Utah pilot plant reveal results of 2-year experiments with extraction of oil from asphaltic sands near Vernal indicate oil can be recovered in commercially profitable amounts.

JOURNALLY SPEAKING

Beating the Figure Men

"Why is the market quotation of our stock so low?"

Many a stockholder is asking that question of many an oil-company president these days.

The best answer we have seen is in a letter to his stockholders from Bud Robineau, president of Frontier Refining.

He blames it on the "figure men," meaning Wall Street's security analysts. He says their arithmetic is right but their reasoning is wrong. He agrees that the oil business doesn't look very promising on paper, but insists that there are plenty of growth and profit opportunities that don't show up in a cold analysis of the statistical odds.

And he cites his own history to prove it.

We wish we had room for all of Bud Robineau's letter, because in these days of impersonal corporate reports his homey, first-person-singular approach is most refreshing.

"I can tell you," his letter said, "that we are operating profitably, our book value has increased, and our working-capital ratio improved, but I can only guess as to various influences that may have affected our market quotations. . .

"Statisticians and 'figure men' for the security people point out that with present oversupply, oil refining and oil marketing are in for a continuing 'tough squeeze' on profit margins. . .

"Figures should be used as important tools in arriving at business conclusions, but they are not the ultimate consideration, in my opinion. This opinion is at least partially substantiated by personal experience.

"Back in 1925 when I wished to borrow $7,500 from my father to quit my job with The Texas Co. and go into the oil-marketing business, security analyst friends of his convinced him with figures that there was no possible profit in oil marketing and made the same 'market squeeze' statement referred to above.

"Luckily for me, Dad disregarded their advice. At first it looked like the 'figure men' were right, as the $7,500 dropped to $300 and a second-hand Dodge truck the first year.

"Then the trend reversed. By 1929 we were the ninth largest marketer in Nebraska, and in 1934 we formed the Bay Petroleum Corp. with C. U. Bay.

"During 1935 I tried to convince Mr. Bay that we should expand marketing into refining. Six times I was turned down because several firms of New York 'figure men' convinced Bay that there was no profit in refining, and again made the same 'squeeze' statement presently affecting companies like ours.

"Finally, in desperation, Armitage and I took a $16,000 option on a 200-bbl. a day topping plant at Cheyenne. We earned enough in 90 days to convince Bay, and that was the start of the Cheyenne, Denver, and McPherson refineries. . .

"In 1940 the Robineau family accepted certain properties from Bay Petroleum in exchange for their Bay stock (forming Frontier), primarily the Cheyenne refinery and western Nebraska marketing properties.

"Again, friendly and well-meaning 'figure men' friends of the family recommended that we take a smaller cash settlement instead of refining and marketing properties, for the same basic 'squeeze' reasons.

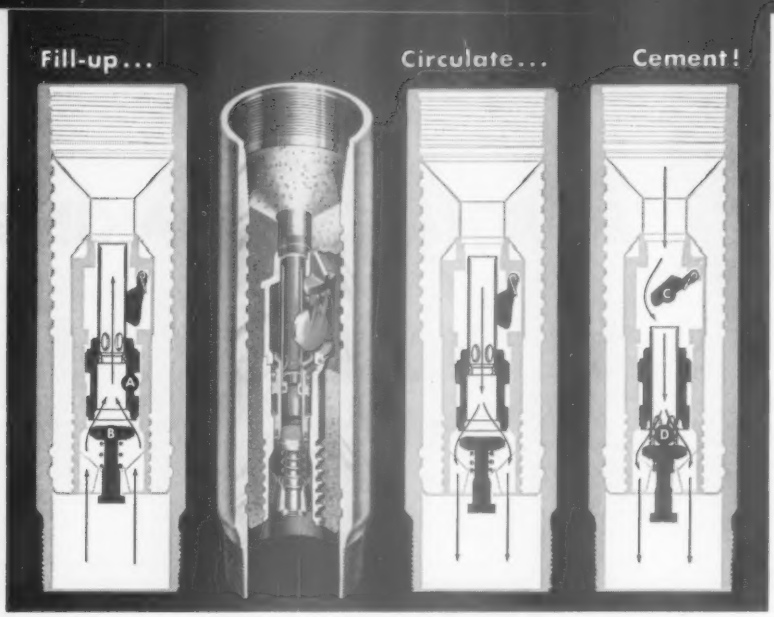
"Thank the Lord, we were a little stubborn and took the properties. You know the result . . . Put on your own value, but in any event I am sure you will agree that the return on the initial risk investment in the 'squeeze' end of the oil business has been more than reasonably satisfactory. (Frontier stock that sold for $1 in 1940 is now, with stock splits, worth $77 and has received $12 in cash dividends.)

"I wonder how many of the 'figure men' who predicted disaster over the years have done as well in their personal portfolios by following strict figure conclusions."

Hurray for Bud Robineau! His story of how he beat the experts in the "squeeze end" of the oil business should be an inspiration to everybody.

It should also bolster the spirits of those investors who have had some doubts about the "figure men's" recommendations to sell the oil industry short.

—Henry D. Ralph.



A Valve Sleeve

B Valve Seat

Fig. 1 Running in. Variable Valve opens at slightest pressure build-up, and permits unrestricted fluid entry.

Baker Circulating Differential Fill-Up Collar, Product No. 109-E M&F

Fig. 2 Valve open for circulating and hole conditioning.

C Flapper Valve

D Tripping Ball

Fig. 3 Before cementing, the flapper valve is placed in operation by dropping a tripping ball and applying pump pressure.

NOW you can Circulate with Baker Differential Equipment

New Circulating Differential Equipment permits circulation at any time while running casing and still retains all the important features of regular Baker Differential Equipment.

The variable valve in Baker CIRCULATING DIFFERENTIAL shoes and collars is activated *instantly* by the *slightest* increase in differential pressure. Filling is practically as free as though open-end casing were being lowered, thus preventing the build-up of *any* destructive pressure surges. The rate of fill is *always* in complete balance with the rate of lowering and there is no danger of overfill because the differential valve automatically maintains the fill at a level below the fluid level in the well.

You get relief from pressure surges at the *bottom of the string* where pressure build-up occurs. There are no spring-loaded valves to be forced open during the filling operation—no restricted fluid entry through undersized side ports, ineffectively located a joint or two up the string.

Baker CIRCULATING Differential Equipment, with its integral back-pressure valve can be run in tandem, but cannot be used with floating equipment. Circulating Collars can be run with inexpensive Baker Guide Shoes. The CIRCULATING Shoe can be run with or without a Baker Baffle Collar for stopping the cementing plug.

Baker CIRCULATING Differential Shoes and Collars cost no more than Differential Equipment without the "circulating" feature.

Ask for your copy of this brochure which contains facts you should know about Baker DIFFERENTIAL Shoes and Collars; and Supplement No. CS-342-A on the new CIRCULATING Differential Equipment.

BAKER OIL TOOLS, INC. • HOUSTON • LOS ANGELES • NEW YORK

What the leaders prescribe for 1960

STUDY THE YEAR-END STATEMENTS and 1960 predictions made by prominent oil-industry executives.

Jot down the principal points they make, put them together in a composite, and see if they form any pattern that can guide you in your own planning and the conduct of your own operations this year.

You will probably come up with something like this:

IMPORT CONTROLS DID NOT fulfill the general expectation that they would restore the U. S. oil industry to a healthy condition. The cause of the industry's continued poor health must be sought elsewhere.

With imports now definitely limited, with stocks of crude and products in better relationship to demand, and with demand due to increase some 3 or 4%, the start of 1960 sees the industry in much better statistical position from which to work out of its recession.

In spite of these favorable factors, the dominant influence on the industry is oversupply and excess capacity in all divisions. This condition will continue through 1960 and beyond.

Oversupply has caused weak prices. Product prices cannot rise until oversupply is eliminated. Crude prices won't go up until products prices and refiners' margins increase.

Therefore the prime task of the industry is to focus attention on the supply-demand balance, to be aware of the market implications of excess capacity, and to avoid the temptation to turn out a greater volume than the market can absorb.

Expansion will not be as easy as it used to be. Yet large capital investments must be made. To do this in the face of rising costs and slim profit margins will require the utmost ingenuity and managerial skill.

Competition will be intense, which means that profits will depend on careful planning and foresighted innovations. More effective use must be made of facilities, and strengthened management must keep close supervision over all activities.

Costs will have to be cut by applying new knowledge in technology, marketing, and management. In production, this includes such things as wider well spacing and automation; in marketing, concentration on the most profitable outlets.

THAT, IN ESSENCE, is how the leaders diagnose the industry and prescribe for it.

They agree that if management will meet these problems head on in a responsible and farsighted manner, the industry can be restored to a healthy condition rather soon.

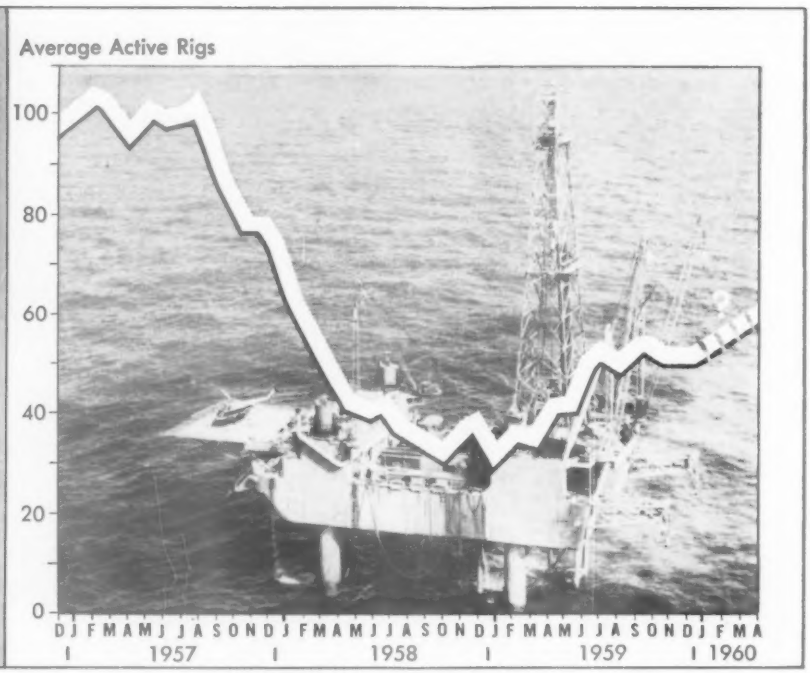
But none of them said that only a few companies—or the Government—should apply these remedies. It is a common task for all operators, large or small, integrated or independent, in every branch of the business.

Rig Count Off Louisiana Moving Up

Peak Activity:
106.5 Rigs, Feb. 1957

Lowest Count
33.8 Rigs, Jan. 1959

SOURCE: Hughes Tool Co.



Offshore Outlook: Not Bad at All

• Activity off Louisiana won't set any records this year, but it will equal, or top, the high level reached during the last half of 1959. Development drilling will get the most attention, but new federal and state lease sales also herald some new exploration work.

Howard Wilson
Gulf Coast District Editor

THE RESURGENCE of activity in offshore Louisiana during the last half of 1959 will continue through 1960 and perhaps increase—and with good reason, too.

Major operators and drillers are looking for a big year of development in the better fields and, with two lease sales set for February, some new exploration is certain for the deeper waters of the prolific oil province.

The year 1960 could find operators drilling for oil in waters well over 200 ft. deep, and they'll have a chance—if they want to take it—to drill in 400 ft. of water in one group of tracts to be leased by the federal Government.

Certainly the year will witness new efforts to build vessels to challenge great water depths, and experiments in underwater completions may begin to reach the stage of practicality.

Offshore operators are talking with greater optimism today than they did a year ago. Every submersible barge on the Gulf Coast is busy today, and even the tender-type operations, which were becoming outmoded, are back in style because of the demand for overwater drilling equipment.

Why? . . . The end of oil's 1958 recession does not, by any means, explain fully the advances of 1959 or the high hopes for 1960.

A Journal survey of offshore Louisiana operators discloses other factors in the picture:

. . . **Operating costs** continue to fall with new drilling techniques and experience.

. . . **Multiple completions** have proved a tremendous aid to payout.

. . . **Expanding gas markets** have spurred development in some fields.

. . . **The discovery ratio** is up.

. . . **Expiration of 5-year leases** made in 1954 and 1955 has inspired some drilling.

All of these developments have joined hands with the general upturn in oil's economy to firm up the Louisiana offshore activity.

Lease sales . . . For 1960, the federal Government and the State of Louisiana will contribute to the upswing by offering important new leases to the industry.

This, at least, is true of the Bureau of Land Management's sale on February 24. The tracts in Louisiana's sale on February 18 will be announced later.

The federal sale at the St. Charles Hotel in New Orleans will be a big one. One major bidder estimates the high bonus offers on 288 tracts (1,608,000 acres) off Louisiana and Texas should top $100 million.

But the bids will vary widely. Most of the acreage is strictly wildcat, although all of it has undergone seismic tests many times in the past and its potential is known.

Two groups of tracts off Louisiana will attract considerable notice—if not high bids. One group of six tracts in the newly added South Addition to the Grand Isle area lies in the deepest waters yet leased off Louisiana. The depths range from 250 ft. to at least 400 ft. and deepen to 600 ft. just a little to the southeast.

Another group of 12 tracts in the new South Marsh Island area is located some 80 to 85 miles from shore and has water depths of 180-200 ft. The tracts are farther from shore than any other leases off Louisiana.

Both of these groups are long distances from production, and they will be costly to drill. Distance and depth certainly will be factors in the bidding, although geologists insist that the prolific salt-dome structures in the gulf easily extend to, or near, these areas.

The Louisiana tracts are in both Zones 3 and 4, and some blocks straddle the line. Where the straddling occurs, the tracts are divided. Bonus money for Zone 3 tracts is kept in escrow pending the Supreme Court's decision on state and federal ownership of the tidelands. Those in Zone 4 go directly into the federal treasury.

Many of the tracts are immediately adjacent to large producing fields, and a number of multimillion-dollar bids are expected on individual leases. Some tracts, however, are in the cast-off class; they were leased before, and the leases expired.

One thing is certain: The exploration departments of the big offshore operators are busy checking out the huge acreage. In opening up brand new areas for drilling, the Government is making it tough on the prophets.

The state sale in Zone 1 may be easier to check out, but the companies will have precious little time to do the job. The deadline for nominations does not pass until today (January 11), and the list of tracts won't be published until 15 days prior to the February 18 sale date.

There has been some fear that the closeness of dates of the two sales may hurt both of them. However, one leading bidder in past sales says this won't make any real difference. The general feeling is that the federal sale should bring in some big bids, while the size of the state sale depends entirely on what kind of leases are offered.

Production Up

CRUDE-OIL production rose 14.28% in Louisiana in 1959 over the previous year, and a further rise for 1960 is predicted by the Louisiana-Arkansas division of the Mid-Continent Oil and Gas Association.

Louisiana's daily production of crude and condensate during 1959 was 980,000 bbl. Charlie S. Wilkins, executive vice president of Mid-Continent Association for Louisiana and Arkansas, said it should top the 1-million mark for 1960.

Crude production totaled 318.3 million barrels during the year, an increase of 39.6 million over 1958. Offshore production of 69 million barrels in 1959 accounted for 35% of Louisiana's total increase over 1958. Condensate production was up 12.88% for the year, rising by 4.9 million barrels to a total of 42.8 million.

Gas production rose 13.62%, up 320 million M.c.f. to a total of 2,674 million M.c.f.

Costs . . . If there is any single development, other than a big discovery, that accounts for the feeling of confidence among offshore operators today, it's the progress made in shaving costs.

This is not something accomplished overnight. But over the past couple of years savings from corner-cutting have been accumulating, and today some wells can be drilled at half the outlay required just a few years back.

One major operator in the Gulf says a well that might have taken 100 days to drill several years ago can be drilled to total depth today in 2 weeks. This same company just recently sank a 10,000-ft. well in 4 days and 22 hours—a feat that might have required 45 to 50 days in 1950 (see p. 44).

Wells which used to cost $700,000 to $900,000 are costing $400,000 to $500,000 today.

Another operator reports similar experiences. It has found that in just the past 2 years, operating costs per well are down well over 20%.

For one thing, drilling contractor rates are well below their peak days of 1955. Where a rig could get $7,500 per day 4 or 5 years ago, it can command only $5,000 today. And even this is above what it was a year ago, when the barges were begging for work.

The drilling contractor, who isn't happy about the rates, is still able to turn some kind of profit on his investment. His crews are more experienced—and that's important in offshore drilling. And he has learned something more about hydraulics to make hole faster. He is using lighter muds with greater pump pressures. He is using more collars and putting more weight on the drill bit. The result is more hole in less time—the difference between making money and losing it.

Multiples . . . If there's any sure way to make money in the oil business, it's to find a number of pay sands with the same hole—and that's what offshore operators have done.

Figures on the number of multiple completions in offshore Louisiana have not been compiled, but the number is large—and growing larger by the week.

At least three operators, Humble, CATC, and Sinclair, have quadruple completions off Louisiana, and at least a dozen have triples. Virtually everyone has duals.

One operator figures he can get two completions for the price of about 1¼ wells. Since each completion rates a full allowable under Louisiana conservation rules, the favorable economics of the technique is obvious.

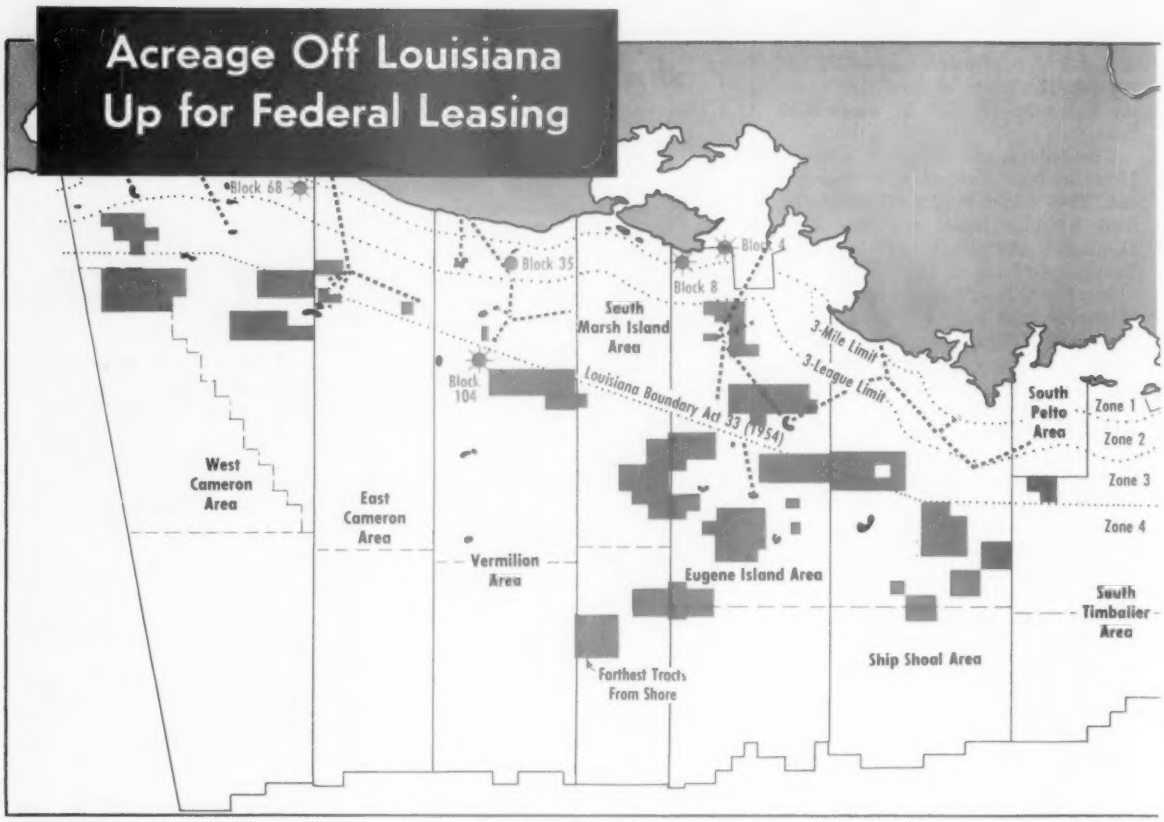
There is one sobering thought, however, on multiple completions. If the Conservation department finds it necessary to cut back allowables in future months, multiple facilities will be subjected to thorough examination.

"Our thinking hasn't crystalized," a state official said last week, "but if it is necessary to reduce allowables, we might require the multiples to take some of the first cut."

This official said he expects that when the March and April allowable hearings are held in February, the state will be asked to cut production. For the first time in 16 months, the state raised the allowable percentage for January and February—from 34% to 35%.

"We have had some criticism for this, but we think we did right for at least 60 days," the official said. "But we may have to go the other way next time."

Gas . . . There is some disagreement among operators as to whether the



marketing of large gas reserves from offshore has been a spur to drilling.

One operator believes it's the "big thing" because of the ready market that is being developed by the transmission companies in the big population centers.

Another sees some stimulant to drilling in the western Louisiana offshore area, but points out that the big push for gas actually is onshore.

Two operators wouldn't put any more emphasis on gas than oil, and one cites the high cost of laying lines, particularly to any great distance.

"You have to find a pretty good field to lay a line." he says.

Discovery ratio . . . The higher wildcat success ratio was another bright spot in 1959—and may spur a stepup in exploratory drilling.

The increased drilling activity in 1959 points up the trend toward more emphasis on development drilling. There were only 15 wildcats drilled off Louisiana last year, compared with 27 during 1958.

But 7 of those 15 wildcats in 1959 turned out to be new fields, giving operators a 46.6% success ratio. That stacks up with 8 discoveries out of 27 wildcats drilled in 1958 for a 29.6% success ratio.

The number of new fields is still far short of the record year of 1955, which had 24 discoveries, and 1956, with 22 new pools. However, those were years when more than 100 rigs were operating.

Expiring leases . . . Considerable new drilling has occurred in the past few months and more can be expected in the immediate months ahead because many federal leases of 4 and 5 years ago are expiring.

The Government leased 400,000 acres in October 1954, and 253,000 acres in July 1955. The untested tracts in the 1954 sale expired on the last day of 1959, and those in the 1955 sale will expire in 1960.

Just how much land went back to the Government on December 31 has not been calculated, but a number of companies put holes down on some of them in recent months. Some leases went the farmout route to get a test.

One new development in the federal lease picture during the past year has been the formation of units by companies with untested adjoining acreage. At least a dozen unit drilling programs have been approved by the Bureau of Land Management. The advantage to the companies is that they can retain the leases by drilling fewer wells. The advantage to the Government is that the acreage gets a test where otherwise it might not.

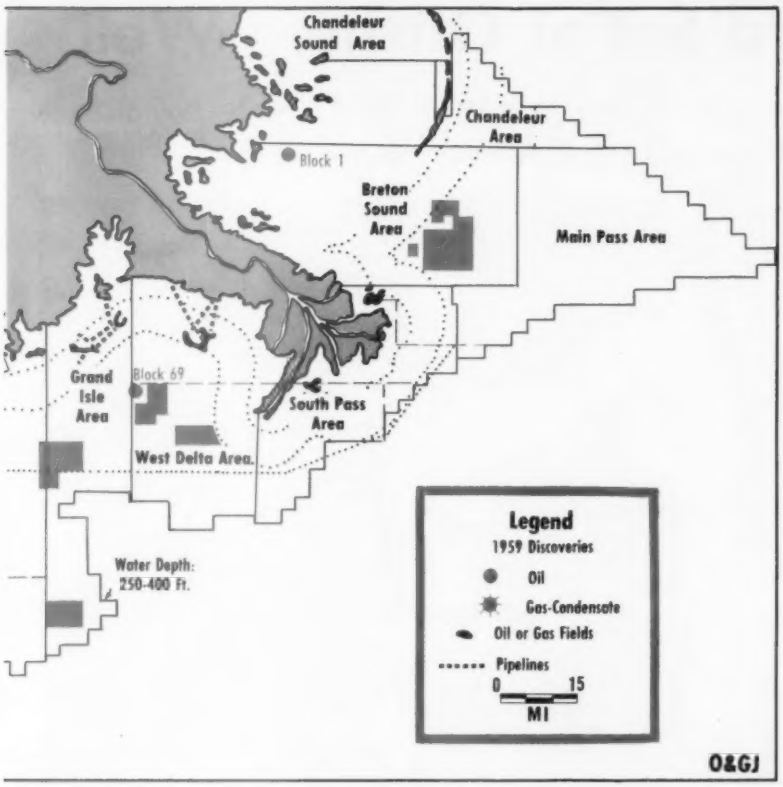
Deep water . . . Serious work is under way in the drilling and production industry to solve the problems of deepwater operations.

Gulf Oil Corp. recently used a lightweight jacket and tender to drill successfully in 205 ft. of water off Louisiana, but this method has limitations. The jacket cannot be used as a production platform, and the drilling depth is limited.

Certainly in moving into waters of 300 to 400 ft. deep, the driller will have to use a floating vessel such as the Nola ships or the CUSS I. Ocean Drilling & Exploration Co. has designed a vessel with a latticework L-shaped hull to cut down the effects of wave action (OGJ, Dec. 14, p. 44). Other drilling contractors are working on their own ideas.

The deepwater tracts in the new federal sale also have spurred discussion of underwater completions. At least two major companies, and perhaps more, already have made tests of such completions in the Gulf of Mexico waters, but no one so far has announced the results.

The attitude toward underwater completions ranges from enthusiastic to obvious pessimism. One drilling contractor who likes the idea predicts that "eventually you will never see



anything on top of the water"—not even in shallow water.

A company exploration and production manager takes a dim view of the technique.

Drilling plans . . . Most of the big operators off Louisiana look for the brisk pace of December's drilling and development to continue through 1960.

This would make 1960 a far bigger year than 1959, which started out slowly and built up gradually. Offshore production in 1958 averaged 157,200 bbl. daily and for 1959 it was 186,300 bbl. But the estimated December average was 206,555 bbl., which points up the buildup.

The number of offshore rigs operating off Louisiana rose from 39 during the last week of 1958 to 54 the last week of 1959. The only ones not working were some 10 or 15 of the tender type, and one contractor says "it looks like these will go back to work by spring."

While there's much talk about the new lease sales, some of the majors do not look for any great increase in exploratory drilling over 1959. They point out that the federal leases are for 5 years, and the rental is only $3 per acre per year. That gives them plenty of time beyond the year 1960 to explore what they've bought.

But the development budgets are up for some companies. One major says it is "carefully selecting" its spots to develop and that others are doing the same.

"We're not drilling the borderline tracts," he adds.

What this means is that companies are defining and producing the discovered fields that show promise of topflight production. The rest can wait.

The contractor . . . With most, or all, his rigs busy, the offshore drilling contractor should be a happy man. But his joy is subdued.

He points out that few barges and offshore rigs are under construction today despite the surge of activity of the past year.

"When you consider the big investment for a rig, your profit is way below the adequate return you could realize in other businesses," one contractor says. "That's why there is no big boom in rig manufacturing. Today's oil-business profits are depressed so much there is no incentive to spend money on a drilling rig when you could build a shopping center instead.

"We took the cream off 3 or 4 years ago. We're on blue milk today."

Quality of Regular Creeping Up on Premium

THE OCTANE SPREAD between premium and regular gasolines narrowed sharply in 1959. And the chances are it will narrow even further this year.

Ethyl Corp.'s nationwide survey for December shows an average octane rating of 99.3 for premium and 92.4 for regular—a spread of 6.9 numbers.

A year earlier premium averaged 99 and regular 91.5—a spread of 7.5.

Both premium and regular increased in quality, but the gap was narrowed because regular climbed 0.9 of a number during 1959 while premium rose only 0.5.

This is an improvement over 1958, when both grades rose only 0.4 of a number, but it is well below the average annual rise of 1.2 numbers for premium and 1.1 for regular over the 1952-58 period.

Reason for the current emphasis on regular is Detroit's preoccupation with economy. Economy has become a major factor in sales, and one way to gain it is to make cars that will use regular.

The switch in Detroit has had a sharp effect on fuel quality, but it has not yet had much effect on the ratio of premium and regular sales. The biggest change in gasoline sales has been on the West Coast, where the quality, and price, of premium have jumped sharply. This has caused a lot of motorists to switch to regular.

Regular has been improved greatly on the West Coast, too, but it still averages only 90.9, or 1.5 numbers below the national average and nearly 3 numbers below the East Coast.

Another area trailing in the quality of regular is the Gulf Coast and much of Texas. Many cities had a lower-quality regular in December 1959 than a year earlier. Average for the area is about 90.3.

Likeliest change in 1960 is an improvement in regular on both the Gulf Coast and the West Coast. If this should happen, the national average for regular will be even closer to premium by the end of 1960.

Drilling Record Set at Offshore Well

• Gulf establishes a tough mark to shoot at by drilling to 10,000 ft. in just under 5 days. Kermac's Rig 46 was used for the job.

GULF OIL CORP. has hung up a record for fast drilling that others may be shooting at for a long time.

The company hit the 10-000-ft. mark in an offshore well only 4 days and 22 hours after the hole was spudded.

A mere 57 hours of the total was actual rotating time. Another 39 hours had been consumed in running, cementing, and nippling up a 2,486 ft. string of 10¾-in. pipe.

In spite of the extreme loading that made such speed possible, only five 9⅞-in. bits were needed. Many previous wells in the field had required twelve.

This matchless performance was on Gulf's well No. 14 in its State Lease 1423 of Block 21, Timbalier Bay area. Kerr-McGee Oil Industries' giant workhorse Rig 46 was on the job. This deepwater, mobile barge was itself a real precedent-breaker when launched in 1956.

Previous quickest time to 10,000 ft. is not known exactly. South Louisiana has the reputation of being the fastest drilling of all domestic oil areas. Still, most drillers consider 10 days unusually good here. A good bet for the runner-up honor has to be a nearby Gulf well completed only a few weeks before. This earlier well reached 10,000 ft. in only 5 days and 18 hours. It was drilled by Kermac Rig 47, sister to the speedy Rig 46.

KERMAC'S Rig 46 was on Gulf's fast-drilling job off the Louisiana coast.

How it was done . . . Gulf personnel attribute the lightning speed to use of high bit weight and rotary speed, to carefully controlled mud, and to making the most of previous experience in the area.

Well 14 was drilled on a day-work basis, with Gulf's men calling the tune on most drilling practices. However, these men pay tribute to the efficiency of Kermac's crews and equipment on the job.

In the deeper portion of the 9⅞-in. hole, bit weights went as high as 90,000 lb. through harder streaks. In the remainder of the hole, weight was held at 60,000 to 70,000 lb. Fifteen to eighteen 7¾-in. drill collars were used to supply this weight.

The rotary table was turned faster than is common in almost all areas except California. Speed ranged from 150 to 275 rpm. When speed reached this upper figure, the drillers slowed rotation by adding more weight to the bit rather than by cutting rotary power.

Average bit life under these high weights and speeds was only about 10 hours.

The drilling fluid was hardly treated until the hole reached 6,500 ft. At that point, treatment began with additions of diesel oil and water-loss reducers. Weight of the fluid was kept at 10 to 10.5 lb. per gal. by watering back; otherwise, formation solids would have boosted weight higher and slowed drilling.

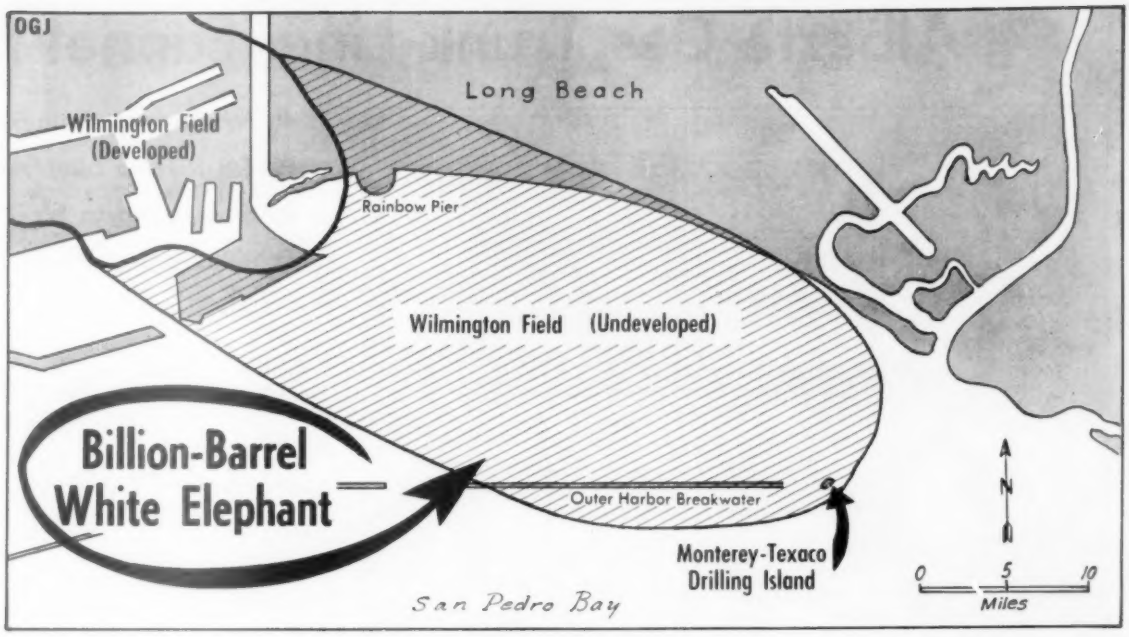
Gulf's hydraulic program was a model for good drilling practice. On the 15-in. surface hole, both of Rig 46's 1,000-hp. pumps were used. In the 9⅞-in. intermediate hole, only one pump was used, but it was put to its limit. Four of the bits were equipped with 7/16-in. jets, and jet velocity was in the 350 to 450 fps. range. The last bit was fitted with ½-in. jets to keep down pressure in the deep hole.

Mud friction losses were low because of the large-diameter of the 5-in. drill string. So, a pump pressure of 2,200 psi. displaced 525 to 600 gpm.

To protect pump parts, sand was removed from return mud both by a sand trap in the system and by a cyclone separator. As a result, one of Rig 46's big pumps drilled almost all the 9⅞-in. hole. Only 10 hours before the bit reached 10,000 ft., this pump began to show wear of fluid-end parts. The second pump, which had been held in complete readiness, commenced circulation immediately and finished the 9⅞-in. portion of the hole without lost time.

The drillers did not ream the hole after drilling the kelly down. When the top of the kelly reached the rotary, a single was added immediately and drilling resumed without pause.

Happily, Gulf's second-to-none well has since been completed as a producer. A string of 7⅝-in. protective pipe was set at 10,000 ft. and a 6¾-in. hole drilled to the pay sands. The hole had been spudded through a 275-ft. section of 30-in. drive pipe.



Billion-Barrel Field With a "Keep Out" Sign

OLD WILDCATTERS must shudder at the thought of one of the industry's great paradoxes — a billion-barrel oil field that may never be tapped.

That would be the undeveloped eastern portion of Wilmington field underlying Long Beach, Calif., and the harbor. It looks like an operator's dream, enough to make any oil hunter's mouth water. For instance:

... **Reserve estimates** range between a very conservative 600 million barrels to 1.3 billion barrels. Most experts lean toward the billion-barrel figure.

... **The field** is located within 10 miles of a number of major refineries and in the nation's largest gasoline-consuming area.

... **A large portion** of the field is in a breakwater-sheltered offshore region where water depths rarely exceed 50 ft.

... **The structure** has been thoroughly mapped geophysically, and drilling at each end has been highly successful.

... **The developed** portion of the structure has produced more than 800 million barrels of oil from seven zones ranging in depth between 2,500 ft. and 6,000 ft. Recovery per acre there averages more than 125,000 bbl.

Rude awakening . . . But the oil operator's dream is shattered by seemingly insurmountable hurdles to drilling in the 5,200-acre field.

The major obstacles include the fear of subsidence and the fact the City of Long Beach doesn't need the oil revenue because of its restricted use. That's why some experts claim the field will not be drilled for a long, long time—if ever.

The disastrous experience with subsidence in the harbor area of the developed portion of Wilmington field has made Long Beach residents gun shy of future drilling. As matters stand, it will take a vote of the people to get approval for drilling in the undeveloped part of the field.

The only way this is about to happen is if the 1,000,000-bbl. repressuring flood in the western portion of the field is a spectacular success. Even then, political observers see little hope that Long Beach property owners will ever approve drilling.

Some property owners already have begun to feel a serious side effect of the subsidence, other than sinkage. Lending firms and insurance agencies are becoming increasingly leery of lending money on properties near any drilling associated with Wilmington field. According to one expert, this factor is seriously retarding further economic development in downtown Long Beach.

Aside from politics, the city fathers aren't interested in drilling the undeveloped area because any revenue would be earmarked.

The 1911 state grant, under which Long Beach gained possession of its tidelands to the 3-mile limit, restricted use of the tidelands and any revenues to harbor development, aids to navigation, and similar commercial developments affecting tidelands.

With the developed part of the field already producing millions of such earmarked dollars, additional tideland oil revenue isn't needed.

Costly mistake . . . About 10 years ago, Long Beach tried to get some of its tidelands oil fortune released from the grant restrictions.

A bill, sponsored by Long Beach, was passed by the state legislature. It provided that 50% of the tidelands oil revenue and all the dry-gas revenue could be declared surplus and didn't have to be used for harbor development.

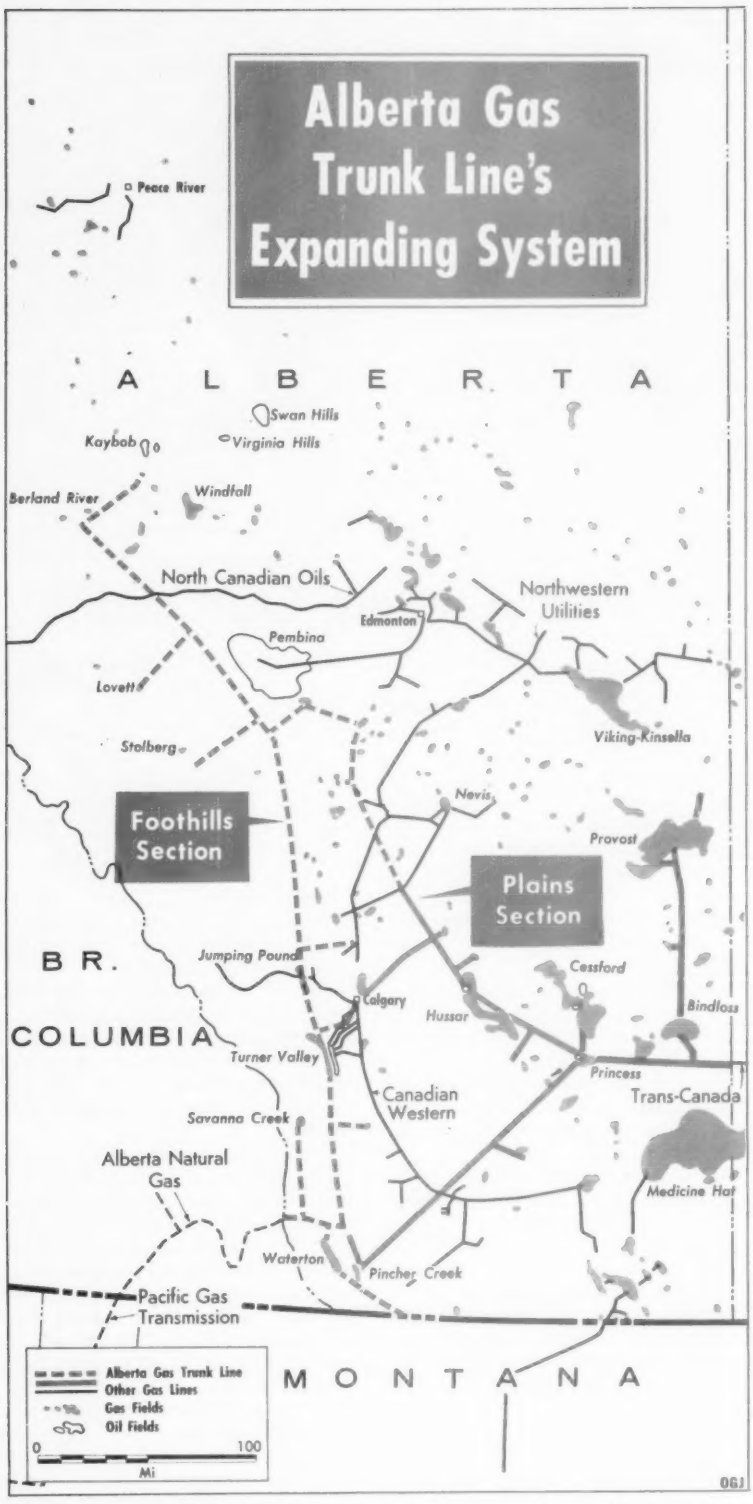
But the law was tested in court, and the California State Supreme Court eventually ruled the revenue could be declared surplus, but that Long Beach couldn't pump it into the general fund. The court ruled the surplus revenue reverts back to the grantor—the state.

That decision cost Long Beach more than $100 million in cash, plus 50% of all future oil revenue and all future gas revenue.

The last legislature did grant minor diversions of trust funds for possible shoreline commercial programs, such as resort hotel development.

But, Long Beach still isn't interested in any more tidelands oil revenue—right now, at least.

Alberta Gas Trunk Line: Funnel for



ALBERTA GAS TRUNK LINE will start moving gas westward to the British Columbia-Alberta border when its Foothills Section is completed in 1960. Currently, the line picks up gas for delivery to Trans-Canada pipeline.

- This big gas-gathering system faces a busy year. It will expand to pick up Foothills gas destined for the U. S. market.

ONE of the pipeline industry's most unusual gas systems — Alberta Gas Trunk Line Co., Ltd.—is counting on its biggest growth in 1960.

Two big projects on the books almost assure this. They involve:

. . . **A $108,056,600** new Foothills system to gather and move Alberta gas southwest into a new U. S. market.

. . . **A 202-mile expansion** of the existing Plains system costing an estimated $13,980,000.

The Foothills project will extend from Berland River area in the north to Crows Nest Pass on the Alberta-British Columbia border. It will pick up gas along the way from several fields in the Foothills Belt that still are being developed.

The gas will be delivered at the British Columbia border to Alberta Natural Gas Co., which is owned by Westcoast Transmission Co., Ltd., and Alberta & Southern Gas Co., Ltd. The line is designed to deliver 500,000 M.c.f. daily for Alberta & Southern and 163,000 M.c.f. for Westcoast. Most of the gas ultimately will reach the California market (OGJ, Nov. 2, 1959, p. 56).

The expansion on the Plains system will bring its capacity to 446,000 M.c.f. daily of gas, all of which is delivered to Trans-Canada Pipe Lines, Ltd., at the Saskatchewan border. Since 1957 about $54.5 million has been spent on 571 miles of line and other facilities on the Plains system.

A monopoly . . . Alberta Gas Trunk Line occupies a unique position in pipelining.

It existed only as a statute on the provincial legislative books 5 years ago. But now the company is one of the largest gas-gathering systems in the world.

A privately owned company, Alberta Gas Trunk Line was organized with the blessings of the Alberta Government. It was given a virtual monopoly for gas transportation within the province.

The main exceptions to Alberta Gas Trunk Line's monopoly position are the Peace River and Medicine Hat

All New Gas Moving Out of Alberta

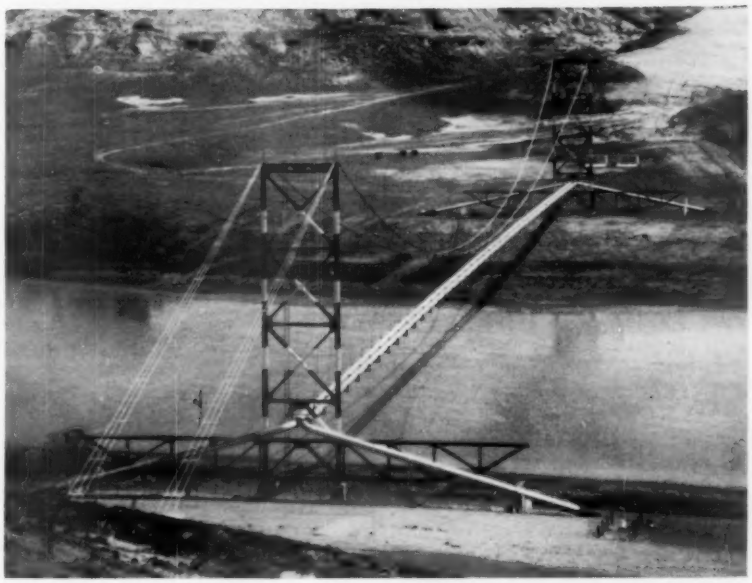
systems. These were in operation before the trunk line was formed. Trunk Line serves the producers, utilities, and gas exporters on a "cost of service basis." By law its operations are confined to Alberta.

The company's board of directors reflects its unusual character. The five are elected and two are appointed.

Board members are: B. F. Willson, representing the utilities; N. E. Tanner, representing gas exporters; A. G. Bailey, D. C. Jones, and J. Grant Armstrong, representing producers and processors; and R. J. Dinning and G. E. Church, the two government appointees.

The board makeup follows the belief of the Alberta Oil and Gas Conservation Board that "more can be accomplished in the interests of all parties concerned . . . if all work together to formulate an efficient method of coordinating production and integrating deliveries of gas."

The man responsible for keeping Alberta Gas Trunk Line's operations efficient is Eldon V. Hunt, general manager of the system (see personality sketch p. 144).



HEAVIEST load carried by any pipeline suspension bridge in the world is the claim for this span across the South Saskatchewan River on the Alberta Gas Trunk Line system. The span is 1,050 ft. and carries two 34-in steel lines 55 ft. above the water.

Story of exports . . . Requests to export Alberta gas began in 1945.

Westcoast Transmission asked the conservation board for a permit to take Alberta gas to the U. S. Pacific Northwest. Peace River gas finally was sold in British Columbia and to Pacific Northwest Pipeline Corp. through the Westcoast line completed in 1957. Export of surplus gas also was authorized to the Canadian-Montana Pipeline Co. for shipment to Montana.

When Trans-Canada Pipe Lines was given authorization to move natural gas to the Eastern seaboard, Alberta Trunk Line was created to do the gas-gathering job. Industry and provincial officials feared that movement of the gas across provincial and perhaps international borders might invite federal controls. If Trans-Canada had built the gathering system, the government might have an entree to regulate prices or royalties and even impose field control. So, the idea which led to Alberta Gas Trunk Line was conceived.

Gas gathered by Trunk Line first flowed into the system in mid-1957. By the end of 1958 the system was valued at $34.8 million and consisted of 358 miles of line, 12 measuring stations, four warehouses, and 46 employe-housing units.

The 1959 capital spending totaled nearly $23 million and involved 122 miles of 30-in. pipeline, 75 miles of 16-in., 50 miles of smaller lines plus a variety of buildings.

A world welding record was set in work on the 30-in. job. Officials of Mannix Co., contractors on the project, reported that more than 4 miles of pipe was welded in a single day, believed to be the most production ever recorded for this diameter.

A river crossing on an earlier section of the system also involved a record—a bridge to carry the heaviest load of any pipeline suspension crossing in the world.

Superintendent Hunt says the crossing on the South Saskatchewan River has a span of 1,050 ft. and clears the mean water elevation by 55 ft. Two 34-in. lines are installed side by side on the horizontal plane.

Operations . . . Gas is gathered by producers who process it to pipeline specifications and deliver it to field collection points at specified pressures.

This policy eliminates need for Trunk Line to maintain pressure regulation at collection points. The gas enters Trunk Line system after being measured through orifice meters and being checked for specifications.

Hunt explains Trunk Line made the checks as agent for Trans-Canada, and the measurements constitute the basis on which producers are paid.

Hunt is understandably proud of the line. He believes it is one of the most modern in the industry.

This same pride is shared by Alberta residents because they own the system. The Trunk Line was financed partially by selling Class A shares with a par value of $5 each to residents of Alberta only. Nontransferrable Class B shares with voting rights are held by utilities, producing, and exporting companies.

So great was the demand for the Class A stock that if all the shares ordered had been made available, $74,107,824 could have been realized. But each applicant was only allotted 20 shares resulting in sale of 2,552,320 shares.

Before the actual certificates were issued, Trunk Line stock was traded in over-counter dealings for $10 to $15. It now trades for $27 and up.

Superintendent Hunt calls the organization and services of Trunk Line unique. "It is privately owned and operated, yet organized by a special act of the provincial legislature," he points out.

"The industry benefits because of flexibility of development and the joint and efficient use of all facilities. The province benefits because Trunk Line is one of the vehicles through which it controls gas export and use."

Workovers Being Contracted in Move

- In 5 years, contractors have increased their share of well-servicing work from 50 to 90%.
- With a few exceptions, operators are getting out of this field. The reason: It's cheaper.

EMPHASIS on trimming costs and reducing housekeeping chores has speeded up the trend toward contracting out servicing work. Still more crews like this one will wind up working for contractors instead of oil companies.

CONTRACT oil-well servicing is still gaining favor among U. S. oil companies.

Many majors and independents contract for 90% of their workovers, rod and tubing jobs, cleanouts, and general service work. Some have hit 100%. Five years ago, companies did about half their work with their own tools and crews.

At least two large companies are bucking the trend. One is increasing its servicing program. And a few still keep a 50-50 ratio of company versus contract jobs.

Two main stimulants are pushing the trend toward more contract work. They are:

... **Lower costs.**

... **Availability** of service units just about everywhere.

New servicing companies have sprung up and grabbed the work load. There now are 2,100 such contractors in the U. S. and Canada with a gross business above $200,000,000 a year.

The servicing industry now has $300,000,000 invested in equipment and is still growing. The future may see:

... **Consolidation** of servicing activities into larger, but fewer, firms.

... **A weeding out,** by cold economics and circumstance, of shoestring operations.

... **A new voice** in legislative halls and industry meetings, seeking "better" insurance rates, standarized contract requirements, and establishment of accepted rules of operation.

1. Advantages

Operators contracting out their work figure they are getting improved servicing at one-half to two-thirds the former cost.

Servicing work can be contracted for $13 to $20 an hour. One operator computes cost of company units at $27 an hour, including depreciation.

In many cases, company units were idle from 40 to 60% of the time, adding to depreciation and maintenance costs. Too, companies with widely scattered operations either had to have eight to twenty units or figure on shutting down a well until one of its units could be moved to the location.

Company crews might be called any day of the week or any time of day. Sunday and holiday work reflected itself in double time and overtime pay. In round-the-clock operations, pay charges zoomed.

Contractors, on the other hand, are available in nearly every active area and can have a unit on the job within 24 hours.

Their crews are generally considered more efficient and more experienced than company crews, because they spend full time at workovers, rod and tubing jobs, and other servicing operations.

Some larger oil companies see a saving of from $1,200 to $1,800 a year on each crew member. This represents cost of worker benefits, over and above his wages.

For a company operating 10 units, with a crew of three or four on each, savings on these benefits, alone, can range as high as $60,000 a year.

At least one company has gone even further with its contracting. It has shifted all of its pumpers to a new contracting firm and is contracting all of its pumping operations.

2. Disadvantages

One major company which clings to its own servicing policies says a company loses control over just how a job is done when it farms out this work.

"Producing crude is our bread and butter," says a company engineer. "We believe it is good business to have our men handling our own tools on little as well as big jobs. We reason that if our units are busy only 60% of the time, it's money in the bank."

A 35-year production veteran favors contract servicing, but he sees in it a threat to competent "rig-floor supervisors" 10 to 20 years from now.

"We're contracting our well drilling now," he says. "When we drilled our own wells, we always had a good backlog of supervisory material among these workers. This supply has gone. Now, we contract our servicing work, and we cut our own throat again as far as developing men to handle rig-floor work in years to come."

Some companies contracting their work say they now must police the jobs more closely. Usually they send an engineer to direct over-all operations.

3. The Trend

The shift to contract work has been more pronounced in the last 2 to 3 years and is more extensive in the Mid-Continent and Gulf Coast areas than on the West Coast. However, one

to Cut Costs

West Coast firm which now does 60% of its own servicing work says it plans to increase contract work this year.

Another company, which has only two company-owned units left, indicates sentiment is a factor in keeping them. Both are handled by company veterans. One will retire soon and the unit then will be sold.

Of the 2,100 contractors operating about 9,000 units, 23% have only one unit. The rush to enter the business is reflected in the fact that 67% of all operators have no more than three units. There are some with eight to thirty units.

An informal survey shows that 30 contractors last year increased the number of units they own. Only three said they started this year with fewer units than they owned a year ago.

The contractors . . . The servicing contractors are divided into two fairly distinct groups.

One group does rod and tubing jobs, bails and swabs, cleans out with sand pumps, pulls casing on abandoned wells.

The other group, sometimes identified as workover contractors, perforates, plugs back, deepens a well, shuts off water, will work with regular cementing contractors, and do well completions.

The first group usually operates with a truck-mounted winch, a hoisting device, and handles bailers, swabs, and wire line. The workover contractors have mud pumps and drilling equipment similar to that used by drilling contractors.

The first group outnumber the workover-type contractors about 10 to 1.

The future . . . Contractors may try to broaden their services in an effort to have workmen and equipment busy full time.

This will help keep their crews intact, improve efficiency of operation, and minimize job turnover.

One contractor with eight units operating and 35 crew members uses them for general lease maintenance and for other field work not strictly labeled well servicing. Another supplements his servicing with a trucking and hauling service.

He sees the servicing contractor in the future doing a larger volume of work at smaller profits. This will make servicing a more attractive package to oil and gas producers and might firmly anchor servicing contract work as an industry must.

watching WASHINGTON

Clyde La Motte

• U. S. tankers fly new distress signals . . .

DON'T UNDERESTIMATE the efforts being made to persuade the Government to require that at least 50% of all imported oil be hauled in American-flag tankers.

Independent tanker operators and seaman unions are stepping up their efforts to this end, and some qualified Washington observers think the campaign may make some headway.

The joint committee for American-flag tankers has submitted to the Office of Civil and Defense Mobilization a 91-page "memorandum" supplementing a request it had made last September for restrictive action.

The latest document stresses the "urgency" for immediate action. The committee claims that what it has been warning would happen is now happening: American-flag operators are being driven out of business.

The committee says that American-flag participation in oil imports has dwindled from 76% in 1948 to less than 5% now.

Unless something is done in a hurry, the committee insists, the American merchant marine fleet is going to lose its vital tanker segment.

The committee is going to press the point that it needs and deserves protection as much as independent refiners who got a new lease on life under the import-control plan because they are able to make a good cash margin by exchanging their oil-import quotas for domestic crude.

In other words, the committee figures that if there is justification for protection for these refiners and for domestic crude producers, there certainly is justification for similar protective action for American-flag tankers.

You may be sure that if they fail to get action from the administration—and soon—they will raise the issue in Congress.

The proposed requirement that half of the imports be hauled in American-flag tankers would have considerable impact.

It would tend to increase the transportation costs for those companies now using "foreign flag" ships.

It would tend to narrow the margin for independent inland refiners who have been swapping their imported crude because higher shipping costs would narrow the margin between the cost of foreign crude and domestic crude.

The tanker committee, however, claims that its proposal would not hike the cost of crude. It apparently feels that the higher transportation costs would be absorbed at the point of production or by the importing company.

• Anti-trusters rap another oil merger . . .

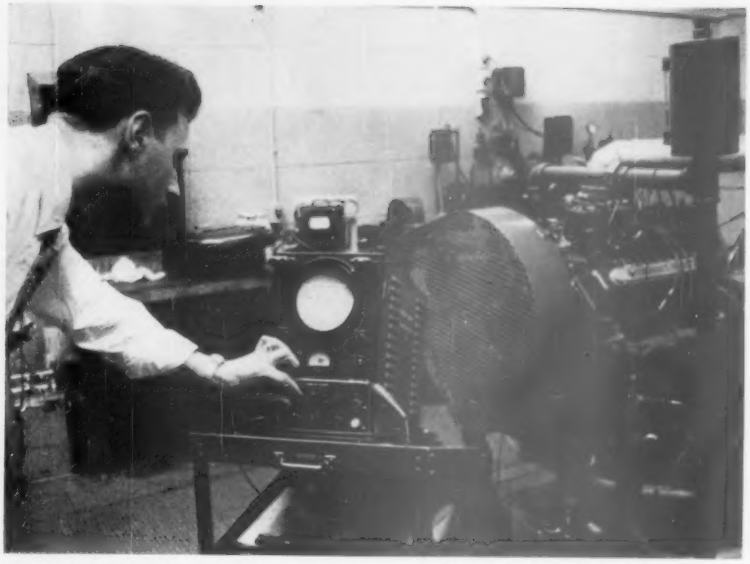
NOTE THAT the Justice Department has clamped down on another oil merger, again demonstrating that it is going to be tough on mergers.

Its latest action was to file an antitrust suit in Michigan in an effort to break up the planned acquisition of Leonard Refineries, Inc., by the Standard Oil Co. (Ohio).

It charges that because the two firms compete in refining and marketing in the Michigan area, a merger would lessen competition and would give Sohio a further competitive advantage over smaller competitors.

The Justice Department made it clear last fall when it blocked a planned merger of Texaco and Superior that it considers antimerger action as its best weapon to protect competition (OGJ, Oct. 5, p. 97).

One of the safest bets in Washington is that the Justice Department will give extremely close scrutiny to virtually any and all oil mergers, and that in most instances it will seek to stop them.



ENGINE ANALYZER showed that knock occurred in some cylinders and not in others. Tetramethyl lead, Socony says, achieved better distribution. It led to development of . . .

New Antiknock Agent

. . . could displace TEL as the major gasoline antiknock additive, Socony researchers say of their new product.

SOCONY MOBIL OIL Co. has an antiknock agent which, its research people say, may in time replace tetraethyl lead.

The agent is tetramethyl lead. It has been under study for some time at Socony's Paulsboro, N. J., research laboratory and is said to be better than TEL in certain applications.

While some companies foresee only limited uses for TML, Socony is enthusiastic about it.

Socony sees its first application in gasolines high in aromatics and low in olefins such as catalytic reformates. Then, they predict, as the industry gains wider experience, TML will become more generally used and "probably will become the major antiknock" agent.

These are some of the specific, immediate advantages they see in the use of TML:

. . . Fuel segregation. TML results in a more even distribution of the antiknock properties of gasoline among the cylinders. This corrects knock caused by nonuniform mixtures.

. . . Catalytic reformate. TML works best with catalytically reformed gasoline. It stands out in the all-important road ratings. It does a particularly good job in cars with manual transmissions.

. . . Aromatics susceptibility. TML's effectiveness is closely related to the aromatics contents of the gasoline. It is most effective in gasolines with 30% or more aromatics. Today's premium and superpremium gasolines average 29% in aromatics and sometimes go well over 40%.

Heres what Socony found in one test with a conventional reformate gasoline:

	TEL	TML
Research O. N.	100.7	101.7
Motor O. N.	92.6	93.5
Road O. N.		
auto. trans.	99.8	101.0
man. trans.	98.0	102.4

Segregation . . . The Paulsboro lab developed TML while attempting to find a solution to the problem of fuel segregation. Its electronic analyzer which tests each cylinder of an engine individually, found that knock occured in some cylinders but not in all. The one antiknock agent that corrected this problem was tetramethyl lead.

By reducing the problem of fuel segregation, TML, according to Socony engineers, not only relieves the designer of that problem but also permits him more flexibility in designing carburetors and manifolds for maximum performance and economy. TML's maximum advantage occurs at low speeds where knock problems occur most frequently.

Some background . . . Experimentation with TML is not brand new.

Ethyl Corp. has experimented both with TML and mixtures of TML and TEL and has filed for patents in this area.

Esso Research & Engineering holds patents here and abroad, some dating back to 1943, covering the application of TML to motor fuel.

Socony says it has found a multitude of patents on organolead antiknock compounds but none specifically on the use of TML in highly aromatic gasolines.

Socony says it has, for the past year, kept Ethyl and Du Pont informed on its work. And both TEL manufacturers say they could manufacture TML without great delay.

More interest wanted . . . Socony says that it disclosed the results of its experiments with TML at this time to encourage broader interest.

Commercialization requires a substantial market and this is more likely to result if other companies become actively interested.

While Socony scientists foresee the probability that TML will become the "major" antiknock agent, those with other companies are somewhat less optimistic regarding its future.

These men agree that TML is effective in combatting fuel segregation and is highly effective in raising the antiknock quality of gasoline high in aromatics. Until they have had further experience, they are unwilling to credit TML with more than such limited advantages and, therefore, limited use.

PROCESSING

Union Oil and Goliad Corp. will build a $12 million gas processing and liquid-recovery system in South Louisiana. The system will consist of an absorption extraction plant, an 85-mile pipeline, and a fractionation plant. The extraction plant will be located about 9 miles south of Kaplan in Vermilion Parish and will have a capacity of 450,000 M.c.f. daily from lines of Transcontinental Gas and Trunkline Gas. The plant will extract 295,000 gal. daily of liquids. The pipeline will extend from the extraction plant to south of Baton Rouge on the Mississippi River.

Canadian Energy Board Holds First Session

- First rulings from new agency are expected in about a month. Six export applications are up for action.

CANADA'S National Energy Board, created by Prime Minister John Diffenbaker to control the flow of gas and other energy out of the country, is open for business.

At the board's first public hearing in Ottawa last week, applications for permission to export gas to the U. S. were submitted by Canada's biggest gas line. Six applications are before the board. It is expected to take about a month to act on the applications.

Trans-Canada Pipe Lines, Ltd., the big carrier running from Alberta to Eastern Canada, asserted at the hearing that exporting gas to the U. S. will not hurt Canadian gas consumer.

Trans-Canada wants to export 204,000,000, cu. ft. per day from Emerson, Man., south of Winnipeg, and up to 204,000,000 cu. ft. per day on an interruptible basis from Niagara Falls, Ont.

Trans-Canada's application is expected to be considered along with five others: Alberta & Southern Gas Co., Ltd., Alberta Natural Gas Co.; Westcoast Transmission Co., Ltd.; Canadian-Montana Pipe Line Co.; and Niagara Gas Transmission, Ltd.

The board first will explore the matters of markets, then reserves and deliverability. It has not been established whether the board will accept the findings of the Alberta Oil and Gas Conservation Board on the matter of reserves. Ian McKinnon, energy board chairman, was formerly chairman of the Alberta agency.

Establishing reserves is a key point up for consideration. A long hearing on reserves might delay a start of construction this spring on some of the facilities included in the export applications.

Objections filed . . . The Ontario Government, in a new submission, supports the concept of export but questions price arrangement in the Niagara Gas Transmission case. Niagara Gas would take gas into upper New York state from the Trans-Canada line near Cornwall.

The Ontario Government intervention states that comparative prices to the consumer would be $7.24 on the Canadian side for 3,000 cu. ft., while $7.24 would buy 25,000 cu. ft. in the U. S. It argues that Canadian gas should not cost less in the U. S. than in adjacent areas in Canada.

"Ontario also objects to Trans-Canada's plan to sell off peak gas to storage in the U. S., contending that adequate storage exists or could be developed in Ontario," the province contends.

In a press conference in Ottawa, the president of Northern Ontario Gas Co., Ralph Farris, said: "We feel that for the next 3 or 4 years Trans-Canada cannot serve two masters—the U. S. market and the Eastern Canadian market."

Predicting higher prices if export is allowed, he said this would hurt not only the Canadian consumer but would prevent Northern Ontario from competing strongly for industrial sales in Eastern Canada.

Trans-Canada is ready with weighty counter arguments. One section of the company's operations sent seven truckloads of documents to support its part of the company brief. Another applicant, Alberta & Southern Gas Co., weighed into Ottawa with 80 lb. of paper work.

Trans-Canada contends there is plenty of gas in Alberta fields to satisfy all Canadian needs and still allow large-scale sales to the U. S. market. Gas can become one of Canada's major earners of American dollars.

Twenty major firms and municipal groups have filed interventions, either opposing or supporting the various export applications.

Western markets . . . An intervention by the British Columbia and Yukon chamber of mines "views with concern" the two applications for taking gas from Alberta to the U. S. Pacific Northwest, contending that if it ever is to have a market for the growing reserves in northeastern B. C., it will have to be in that same area.

"The supplying of export markets with the most accessible and what may be the lowest cost gas Canada possesses, which is in southern Alberta, would be considered as high-grading our resources and not in the best interests of this country.

"Such action could place our vast northern gas fields in virtual deep freeze for many years, and bring to a standstill the vigorous exploration program now under way," the B.C. and Yukon brief states.

BRIEFS . . .

Sun Oil Co. has begun operation of a $1,200,000 hydrodesulfurizer unit for hydrogen treatment of heating oils at its Marcus Hook, Pa. refinery.

Standard of California plans to expand its 32,000-bbl. Hawaiian refinery, which is now being built. Heading the list of new equipment, which will almost double the original investment of $33 million, will be a 13,000-bbl. fluid cat cracker and alkylation plant. In addition, hydrogenation and isomerization units, a carbonmonoxide boiler, dust recipitator, sulfur-recovery equipment, and more tankage are planned. The first units at the plant are scheduled to go on stream next October. The new units will be completed in mid-1962.

Continental Oil will build a 20-million-gallon cyclohexane plant at its Ponca City, Okla., refinery. Procon, Inc., will start construction immediately and complete the plant by September. Hydrogen from the refinery's cat reformers will be used to convert benzene into cyclohexane. The plant will be Oklahoma's first to produce cyclohexane and the fourth in the country.

Also for Refiners . . .

IN THE NEWS: The octane spread between premium and regular gasolines narrowed sharply in 1959—the same trend will hold through 1960 (p. 43) . . . Socony Mobil researchers are boosting tetramethyl lead as a highly efficient antiknock agent for gasolines from catalytic reformates (p. 50) . . . Long strike ending at Amoco's Texas City refinery (p. 54).

PLUS THESE TECHNICAL REPORTS: Radioactive tracers pinpoint entrainment (p. 70) . . . Lube-oil analysis, a practical tool in preventive maintenance (p. 80) . . . How costs will be cut in tomorrow's refineries (p. 85) . . . New knock-test method promises savings (p. 89).

Kentucky Blowout

A WILDCAT on the farm of State Rep. Cleta Garner, 8 miles north of Albany, Ky., created excitement when it blew oil 50 to 60 ft. in the air at a rate of 140 bbl. hourly. The well was plugged, but the pressure cracked the choke (photo). Oil flowed around the plug for several days and was stored in open pits. Production is 34°-37°-gravity oil from Stone River age (lower Ordovician) formation at 1,000-12 ft. Operators include L. H. Horne of Chicago (inset), a relative of Negro Songstress Lena Horne, and Allen A. Borton and associates of Nowata, Oklahoma.

Ready for Takeoff

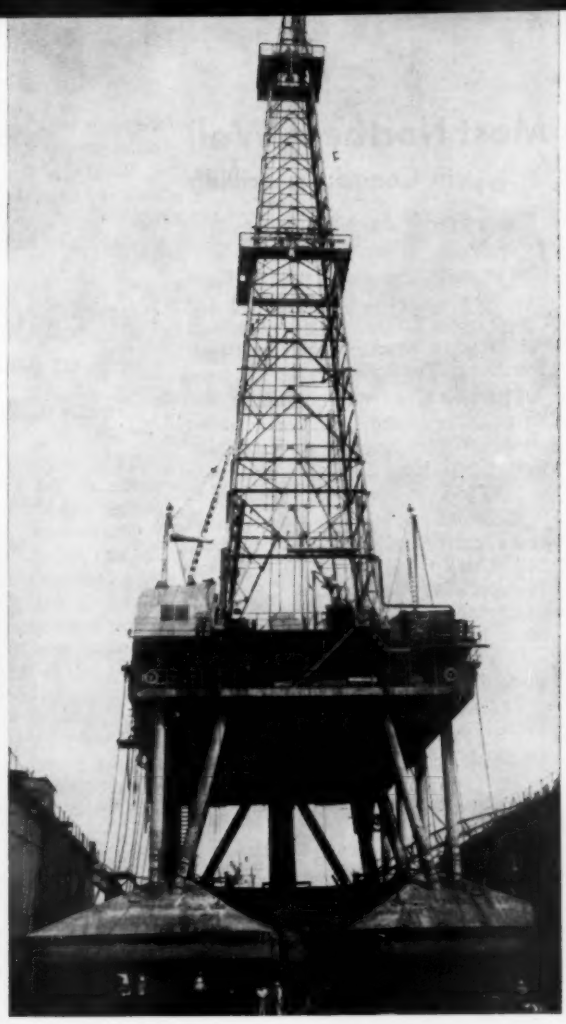
A "HYDROFOIL" launch soon will be skimming over the waters of Lake Maracaibo carrying up to 50 drilling workers to offshore locations.

The latest in offshore conveyances was built in a Netherlands shipyard for Cia. Shell de Venezuela. The high-speed vessel can travel at 35 knots. As the speed increases, streamlined planes called "hydrophils" lift the hull out of the water.

The launch is 70 ft. long and is powered by a 1,350-hp. Mercedes-Benz diesel engine.

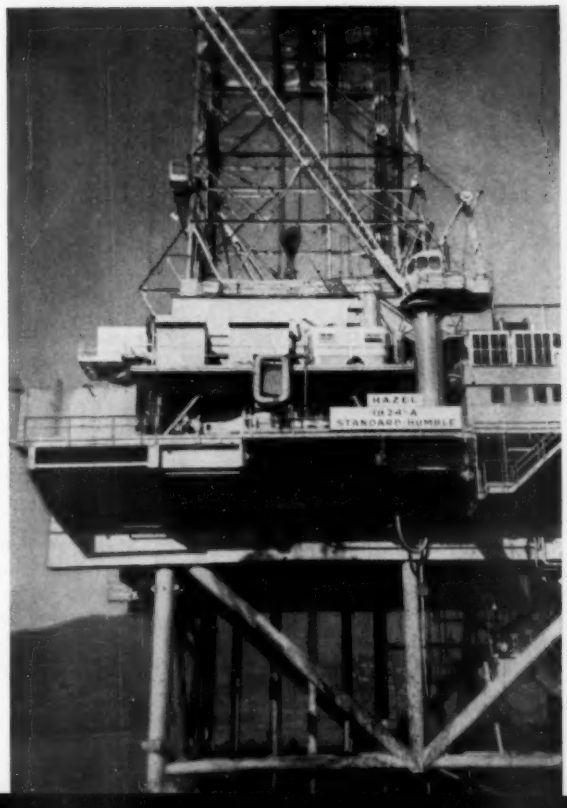
Fish-Eye View of Offshore Rig

THE CALIFORNIA CO.'S offshore drilling rig, S-45, makes an impressive sight when viewed from the floor of a dry dock. The big unit is at the New Orleans dry dock of Todd Shipyards for repairs of its hydraulic rams. In order to make the repairs, the mobile platform was lifted 12 ft. above the floor by means of blocking.



New Logger Checked Out

A NUCLEAR LOGGER is being developed for general oilfield service after being tested in California, Texas, Utah, Louisiana, and Wyoming. The new tool is called the NML—Nuclear Magnetism Log—by its developers. The logger was jointly developed by the Byron Jackson Division and Research Center of Borg-Warner and Standard of California's research subsidiary, California Research Corp. Alex Hildebrand, right, head of California Research's La Habra laboratories, checks the new tool before one of its tests.



"Hazel" Is Just a Working Girl

A TOUCH of femininity has been injected into the search for oil off California. Feminine names are being given drilling platforms under the state's recently adopted naming system. The Standard of California-Humble platform off Summerland has been christened "Hazel." A sister platform named "Hilda" will join "Hazel" off Summerland. A third one, "Helen," will work for Texaco off Gaviota. The naming system developed after California's coastline was divided into alphabetical zones.

Most Northern Well

. . . in Canada is drilling north of Arctic Circle.

CANADA'S most northern wildcat has been spudded by Richfield Oil Corp. on a 3.5-million-acre block in the lower Mackenzie River basin, Northwest Territories.

The site is 45 miles north of the Arctic Circle and about 100 miles north of the nearest settlement at Fort Good Hope. The Arctic Ocean is only 175 miles north of the site.

Richfield got into the play when it and French Petroleum Co. of Canada, Ltd., Clark Oil & Refining Corp., and Hudson's Bay Oil & Gas Co., Ltd., jointly acquired an 85% working interest in the block from Scurry-Rainbow Oil, Ltd. Scurry and Canadian Devonian Petroleums, Ltd., put together the big block in 1957 and 1958. Canadian Devonian retains its 15% working interest.

Peter Bawden Drilling Co. rig was moved to the site of 1 Richfield et el. Grandview Hills in a series of land and water jaunts starting last summer.

The 550-mile journey from Edmonton to Hay River was made by truck. Then barges moved the equipment 780 miles across the Great Slave Lake and up the Mackenzie River to a point 85 miles northwest of Fort Good Hope. This phase of the trip was accomplished by mid-September. The equipment stayed on the beach until mid-November when subzero weather permitted tractor operations between the river and the drill site 20 miles to the west.

Richfield, as operator on the block, said additional geophysical work is planned for next summer to further evaluate the huge holdings.

Long Strike Ending

. . . as Amoco, union settle Texas City plant issues.

THE American Oil Co. refinery strike at Texas City reached an apparent end last week—after 190 days.

The company and the Oil, Chemical and Atomic Workers Union reached a contract agreement after 32 hours of continuous negotiation in Galveston's Buccaneer Hotel. The contract proposal was to be submitted to the union membership for ratification.

Details of the contract agreement were not announced immediately, but apparently the provisions on work assignment and job classification represented a compromise.

The union struck late July 1 after the company refused to change the old contract and grant the OCAW certain authority over assignment of duties outside the usual craft lines.

The strike of the 1,250 workers was the longest in Gulf Coast refining history and cost the workers some $4 million in wages. The company operated the plant with supervisory personnel during the strike.

The long strike spawned several lawsuits by the company, the union, and individual workers.

Tax Ruling Awaited

. . . involving royalties on shut-in gas production.

A FEDERAL judge in Houston will decide soon whether a person who collects annual royalty payments on shut-in natural gas can claim the depletion allowance in figuring federal income tax.

The case came before Federal District Judge Joe Ingraham after the Bureau of Internal Revenue denied a $13,494 tax refund claim made by Mrs. Flora Johnson, Edinburg, Tex., and her two sons.

Mrs. Johnson received some $122,000 in 1954-56 from Superior Oil Co. under the shut-in royalty clause of her 8,165-acre lease contract. Four gas wells were located on the land but were not producing because no lines had been laid to them. The royalty amounted to $5 per acre per year and serves to extend the time of the lease.

Mrs. Johnson's attorney contended before Judge Ingraham that such payments are similar to bonuses or advance royalties paid to leaseholders and that depletion allowances are permitted in such cases.

The Justice Department said the payments are similar to rentals paid on a lease prior to drilling.

Attorneys in the case said that, as far as they knew, no court test had ever been made of the question of depletion for shut-in gas royalties. Ingraham has taken the case under advisement.

INDUSTRY BRIEFS . . .

Smog no longer is the exclusive problem of the Los Angeles basin. It gained state-wide stature last week when California Governor Edmund Brown said he will call a special session of the legislature in March to consider the problem. Brown said the special session would consider legislation setting up a motor exhaust test center with additional provisions for requiring installation of antismog devices on autos by manufacturers when a workable one is developed.

A committee to study proposed changes in New Mexico's common-purchaser, common-carrier, and ratable-take statutes has been named by the Independent Producers and Royalty Owners Association of New Mexico. Members are Kermit Nash, Hobbs attorney, chairman; Charles C. Loveless, Roswell, and Raymond Lamb, Artesia. Next regular session of the New Mexico legislature is in 1961.

Murphy Corp., El Dorado, Ark., will offer to exchange shares of the company's common stock for common stock of Amurex Oil Co., Calgary, on the following basis: One share of Murphy for 8 shares of Class A Amurex; and one share of Murphy for 80 shares of Class B Amurex. The offer will be limited to Amurex's U. S. stockholders.

Musgrove Petroleum Corp., Wichita, a subsidiary of General American Industries, New York, has been sold to Musgrove Drilling Co. for more than $1 million. Musgrove Drilling is a partnership formed by chief executive officers of Musgrove Petroleum. The deal included 210 producing wells on 86 leases, mostly in Kansas.

Crescent Petroleum Corp. swapped the California synthetic graphite plant of Crescent Carbon Corp., a wholly owned subsidiary, to Great Lakes Carbon Corp. for certain oil and gas properties located in Indiana, Illinois, Kentucky, Kansas and Texas.

Missouri may have its first new oil pool in 5 years. The new prospect is in the northwest corner of the state on the Missouri side of the Forest City basin. William Gruenewald 1 Currie, Section 21-63n-40w, 35 miles northwest of St. Joseph, had a good oil show in the Viola Ordovician at 2,944 ft. A drill-stem test at 2,565-90 ft. got 250 ft. of 40°-gravity clean oil plus 10 ft. of oil-cut mud. A pump test is being readied.

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Long Production Cutback Pays Off at Headlee

• Operators in the big West Texas field figure they have saved 50,000,000 bbl. of crude by holding down output for 3 years and building up pressure.

TO MANY, January 1 meant simply that another year had slipped away and a new one was starting.

It signaled much more to operators in West Texas' big Headlee field.

For January 1 was the day that Headlee was restored to the state-wide allowable schedule in Texas after producing at a stringently-pinched 6 producing days a month since November 1, 1956.

The restoration was accomplished in routine fashion via a simple notice from the Texas Railroad Commission after an October hearing into the big reservoir's performance.

This routine order, however, officially wrote finis to one of the most remarkable exhibitions yet by U. S. oil operators of foresight and responsibility in the field of conservation.

For headlee operators asked for the deep cut in their daily oil take from the pool in order to save an estimated 50,000,000 bbl. which would have been lost at the then-current 15-day producing pattern.

The Headlee operators, led by Texas Gulf Producing Co., actually sought a cut in allowable to only 3 producing days. The commission compromised on 6.

The 50,000,000 bbl. is the volume of oil that would have been lost if Headlee pressure were permitted to drop below the saturation level. The low allowable was sought to slow down the pressure drop and give the operators time to unitize and start pressure maintenance before the critical point was reached.

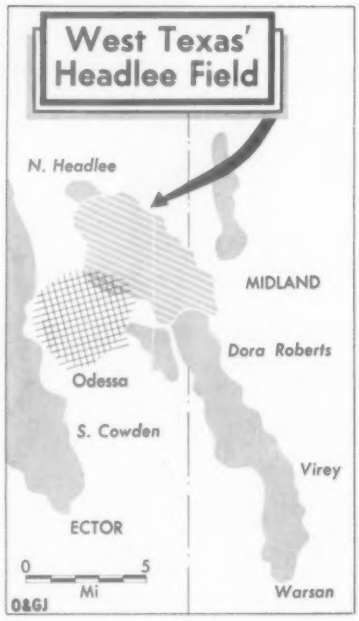
It took a year to get the unit formed in Headlee, a pool then in the early stages of development and with its bounds still being extended.

Injection of gas into Headlee's tight Devonian pay began in December 1957 at an unusually high input pressure of 5,000 psi.

Unit mushrooming . . . At the start, the unit took in 8,390 acres and 30 producing wells—three of them converted to injection service.

Unit bounds since have been extended three times to take in a current total of 15,810 surface acres and 92 wells.

Gas injection into the 11,800-ft. pay now has been hiked from the initial 1 to 2 million cubic feet daily through 3 wells to roughly 40,000,000 daily through 18 inputs.



Pressure in the center of the field, where most production and injection has taken place, has increased slightly since unitization. It has climbed on the unit's outer edges, too, and is well above the critical level of 4,450 psi.

All told, the unit has injected about 7.7 billion cubic feet of gas since December 1957. And it has produced during that time nearly 2,500,000 bbl. of oil.

More to come . . . The unit has spent roughly $13,000,000 on the program.

Still further expenditures will swell the total outlay ultimately to more than $25,000,000, Texas Gulf estimates.

Field bounds still have not been defined. Development is still moving westward within the city limits of Odessa.

By the end of 1960, the unit expects to have 111 wells. Ultimately, at full swing, it expects to have 164—with about 40 of them injection wells.

The danger of field pressure dropping below the critical level now has been averted. The unit estimated that it would lose at least 50% of reservoir liquids via fallout if pressure should fall as much as 50 psi. below the saturation level.

In such an event, it figured it could recover no more than 16,000,000 to 18,000,000 bbl. of oil from the reservoir. With the present pressure-maintenance program, the unit estimates it will eventually produce 60,000,000 to 65,000,000 bbl.

Credit not granted . . . Though the commission put Headlee back on the state-wide pattern, it has not yet granted an allowable credit sought by the unit for overinjection.

Texas Gulf, as operator, proposed that the basic per well allowable be held at 57 bbl. per well per calendar day. It asked further that a bonus allowable be granted any operator replacing 100% of reservoir voidage caused by production.

PIPELINE BRIEFS . . .

Contract to build 126 miles of 30-in. loops in New Mexico on the El Paso Natural Gas Co. system has been awarded to R. H. Fulton & Co., Lubbock, Tex. The job, to start immediately, will be directed by Supt. H. A. Tinkler from Tatum, N. M.

R. H. Fulton & Co. has received a contract from Natural Gas Pipeline Co. of America to lay 28 miles of 10 and 12-in. in Love County, Oklahoma, near Marietta, to connect the Enville and Southwest Enville fields. Three producers will receive 15½ cents an M.c.f. and two will receive 15 cents an M.c.f. Deliveries are estimated at 12,337 M.c.f. per day for 17 years, with volume declining thereafter.

A 75-mile construction program in Pennsylvania has been completed by Peoples Natural Gas Co. with Joyce Western Corp. and H. L. Gentry Construction Co. performing most of the work. Some 38 miles of 12 and 20-in. will be laid this spring and summer. Projects are not yet under contract.

New Mexico's Tax-Payment Law Clicks

- Cumbersome system made easy with two monthly checks and one report to cover severance, royalty, ad valorem, school, and conservation levies.

NEW MEXICO oil and gas operators and purchasers have begun paying their monthly $3,000,000 state tax and royalty bill with a single monthly filing and a pair of checks.

Until the 1959 state legislature created the New Mexico Oil and Gas Accounting Commission, beleaguered operators were mailing four tax payments and a royalty check to as many different state agencies or divisions of agencies on as many different dates.

They paid severance tax (2½%), school tax (2%), conservation tax (0.14%) and ad valorem tax (averaging 1½%). Operators with production on state land (one-third of all oil and gas production in the state) made another payment of (12½%) royalty.

The laws governing computation and payment of these taxes were a bookkeeper's nightmare. Definitions on what was to be taxed, how and when were varied, inconsistent, and contradictory.

But since September 1, payment of all taxes is made with one check and computed on one form and mailed to the O&G Accounting Commission at Santa Fe. Royalties on state land lease production, although accounted for and computed on the same form, are paid with a check made out to the state land commissioner.

What it is . . . The Oil and Gas Accounting Commission is the brainchild of the New Mexico legislature's interim finance committee and the petroleum industry, represented by the New Mexico Oil and Gas Association.

The lawmakers and association specialists got together 2 years ago to revamp the old system. Their purpose was not to alter tax rates, but to simplify their payment, eliminate confusion, and streamline reporting and collection methods.

The result was a package of six bills passed unanimously in both houses of the 1959 legislature.

Briefly, the statutes:

. . . Created the Oil and Gas Accounting Commission as a single, central collecting agency with a $169,380 annual budget.

. . . Corraled all the pertinent taxes, simplified them, and provided for their payment monthly with a 65-day deadline after the close of the month covered by the report.

. . . Provided that the commission would be composed of the governor, John Burroughs; the land commissioner, Murray Morgan, and an appointed executive secretary, Johnny Walker.

How it works . . . The commission set up a complete IBM system for carding its entire operation. Operators or purchasers report by "production units"—that is, by leases, generally.

Each production unit is represented by a single card in the commission's files. This card contains all the information to compute and check tax-remittance reports.

Operators report sales by production unit for each month. Purchasers report all purchases by production unit.

Two forms, laid out on a simple step-by-step basis, are used by the taxpayer to compute all his taxes and his royalty payment, if he operates on state land.

The forms with the checks are mailed to the commission, which checks the report and payment. Once monthly the commission certifies how much has been collected in severance, school, conservation, and ad valorem taxes, and those amounts are distributed to the appropriate state or county bank account.

Although the commission operates on a state general fund appropriation, the law requires that 6% of collections on severance, school, and conservation taxes be set aside in the general fund before being credited to respective accounts. This 6% "hold back" is expected to more than pay for the commission's operation, along with a sum charged the land office for relieving it of the royalty bookkeeping chore.

Reaction . . . So far, with the first month's payments in and accounted for, everyone is pleased with the new system, although the Bureau of Revenue has winced a little over the loss of 6% of the taxes it had collected for administering school and severances taxes.

The New Mexico Education Association showed some concern over what it thought would be a lag in payment of the school taxes, but that concern has been allayed.

The New Mexico Taxpayers' Association reports it is pleased with the new system. The industry is unanimous in its approval.

A contract to build a 116-mile 34-in. line for Pacific Lighting Gas Supply Co., to connect with the Transwestern line at the Arizona-California border, has been awarded to Engineers Limited Pipeline Co. and Pacific Pipeline Construction Co. Work on the joint venture started last week under Supt. Lee Erlewine with headquarters at Ludlow, Calif. The line will extend from Needles to Newberry, Calif.

A 100-mile gathering system has been completed by Mid-Continent Pipe Line Co. connecting 100 leases with 3,500 bbl. daily of crude production in Alfalfa and Grant counties, northwestern Oklahoma.

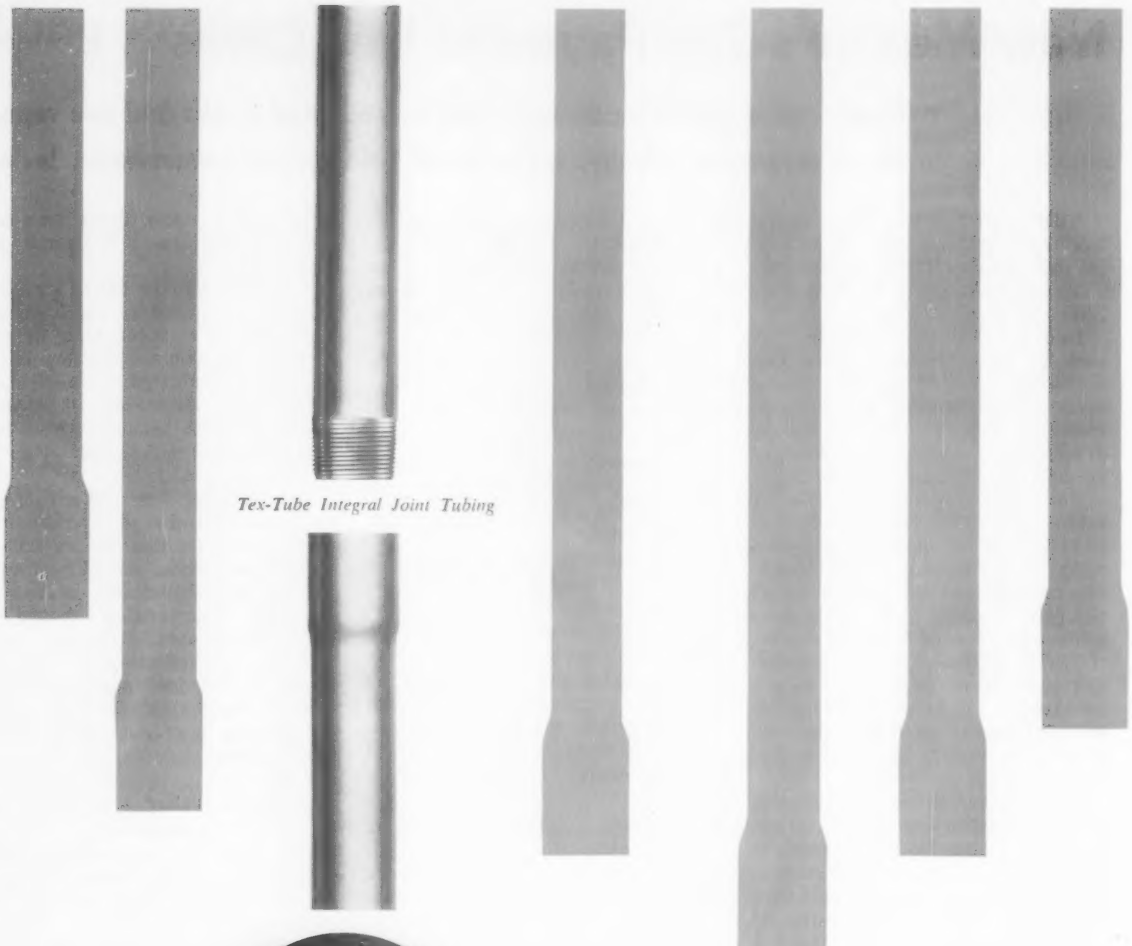
Winter peaking service for up to 212,691,000 cu. ft. of gas daily will be provided by Texas Eastern Transmission Corp. to 22 customers under temporary authority granted by FPC last week. Texas Eastern also will supply 38,840,000 cu. ft. daily to Algonquin Gas Transmission Co. for the same type of service.

Also for Pipeliners . . .

IN THE NEWS: Alberta's big gas-gathering system plans a busy year. It will expand to pick up Foothills production destined for U. S. (p. 46) . . . Canada's new Energy Board starts its first hearings (p. 51).

A complete list of pipeline projects is carried in the last issue of each month. Current projects are carried in Pipeline Briefs.

PLUS THESE TECHNICAL REPORTS: Tests shed light on orifice-plate bending (p. 76) . . . Floating plastic tank hauls oil products (p. 84).



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Conservation Law Proposed for Kentucky

• Waste, close spacing, and pollution have pointed up need for conservation law. Proposed law would prevent drilling close to a lease line.

AN OIL-conservation law for Kentucky will be considered by the state's legislature at its current session.

The proposed law was drafted by the Kentucky Oil and Gas Association for submission to the lawmakers.

Kentucky, like several eastern states, has no oil and gas-regulatory statutes, other than certain provisions about drilling through coal beds. As a result, the current shallow play in Green and other counties of central Kentucky has seen close spacing, waste of oil, and pollution of fresh-water supplies.

The association's draft would not limit internal spacing nor the number or location of wells within a lease. It would prohibit drilling close to a lease line.

Oil wells could not be drilled less than 200 ft. from the lease line, and gas wells would have to be at least 500 ft. from the line. Along the line, oil wells would be 400 ft. apart and gas wells 1,000 ft.

If a tract is too small for compliance, pooling of surface rights would be required in order to make up a drilling unit. No other type of forced pooling or unitization is provided.

Wells could not be drilled without a permit and payment of a fee of $25. A location plat would be filed with the application. Drilling logs, casing programs, and plugging records would be filed during the drilling. A well could not be abandoned without conforming to plugging regulations.

A Director of Oil and Gas Conservation would be created in the Department of Mines and Minerals. The director would have rather broad powers to write regulations and administer the act. An advisory board of five men experienced in the oil business would be created to assist in writing regulations and to supply technical information and advice.

The proposed act has more-or-less standard definitions and prohibitions of physical waste and damage to oil and gas reservoirs or to fresh-water supplies. It states that it shall be liberally construed to foster conservation, protect correlative rights, prohibit waste and unnecessary surface loss and damage, and encourage maximum recovery of oil and gas.

One provision states that the act may not be construed to limit production to prevent economic waste or to limit production to market demand.

The draft is the result of long study by the association. It is a compromise between those operators who wanted no regulation and those who favored a complete conservation law along the lines of the model statute suggested by the Interstate Oil Compact Commission.

Several in the latter group, however, say that the proposed law will be a big step toward conservation and will end many of the chaotic drilling and producing practices now prevalent in Kentucky.

Pure Offers to Buy Out Woodley Petroleum

PURE OIL CO., the nation's sixteenth largest refiner, will strengthen its producing operations by acquiring Woodley Petroleum Co. in a stock exchange deal involving some $45 million to $50 million in stock.

Woodley is a 37-year-old Houston company with 9,300 bbl. daily of crude production, principally in Texas and Saskatchewan. It holds 1.5 million acres in Canada, Alaska, and Arizona for future exploration.

The company owns a 38% interest in Great Northern Oil Co., St. Paul, which operates a 33,000-bbl. refinery at nearby Pine Bend. This is Woodley's only refining interest. Woodley also owns an interest in three crude lines in Saskatchewan and Minnesota.

The Woodley company owns more than 300 oil wells, part of which are produced by Woodley Canadian Oil Co., a Canadian subsidiary. It had a net profit of $3,094,451, or $3.77 per share in 1958. For the first 9 months of 1959, it had a net profit of $2,706,015, or $3.17 per share.

The principal stockholders in Woodley are J. R. Parten, W. T. Moran, Houston independent, and Mrs. Dallas B. Sherman, daughter of the late E. L. Woodley, who founded the company with Parten in 1922.

The move to merge Woodley into Pure received the approval last week of the boards of directors of the two companies. Pure will issue 1,193,881 common shares in exchange for all of Woodley's 852,772 outstanding shares. This amounts to 1.4 Pure shares for one share of Woodley.

Pure has four refineries with 183,880 bbl. daily capacity, while its production amounts to about 60,000 bbl. daily. Pure's president Robert L. Milligan, said that Pure, by acquiring Woodley's properties, will take "another substantial step in its program to develop additional crude-oil production and reserves in the Western Hemisphere."

The two companies did not disclose specifically what the future will be for Woodley employes but said that "substantially all" of them will have an opportunity to transfer to "comparable positions with Pure."

Woodley stockholders will meet March 23 in Houston to approve the stock exchange, which would become effective April 1.

Parten said there will be no exception to the plan for merging all of Woodley's assets into Pure. Woodley will retain its 50% ownership of Seven J Stock Farms, Inc., of Texas, which consists of 11,000 acres in Houston County between Crockett and Madisonville. Parten personally owns the other 50%.

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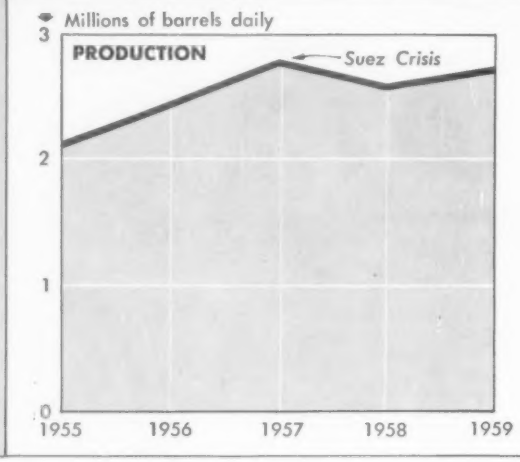


Oversupply, Low Prices Hurt Venezuela

● Latin America's biggest producer faces a dim future unless crude postings increase and demand picks up. Companies operating in Venezuela also have cut capital spendings, which means there may be less activity in the years ahead particularly with a world-wide surplus of crude.

Ray Gibson
District Editor

AFTER a full year of operation under a new oil policy, the Venezuelan Government is a little shocked at what has happened to its oil industry.

It was just a year ago that Venezuela boosted income taxes overnight without any warning. The industry cried "foul," but Venezuela stuck by its guns. The government insisted this was in line with a new policy designed to give the country more from its industry than it had been getting.

In spite of the fact that 1959 crude production is almost a record, the government's income from oil is down and so is industry profit. The hard economic facts involved in a world-wide surplus of oil drove posted prices of Venezuelan crude down after the income-tax increase went into effect. Both the government take and industry profits dived.

An even more disturbing long-range trend is the marked slowdown in almost every phase of the Venezuelan oil industry.

The new administration has preached loud and long during the past year that it would be perfectly happy to hold Venezuela's oil production static at about 3 million barrels daily. Administration spokesmen say they are not interested in expanding the industry in an effort to keep up with the world.

Faced with this kind of government policy, the country's oil industry has reacted defensively.

The results were pretty well summed up recently by Dr. Humberto Penaloza, director of economics for the Ministry of Mines, at a meeting of the Caracas Petroleum Section of the Society of Petroleum Engineers of AIME. Dr. Penaloza views most of the results with alarm.

His estimates for 1959 show:

... **Net oil industry income** after income taxes will be about $377.4 million, down from $484.8 million.

... **Government income** from oil operations will slip to about $781.5 million, down from $922.8 million.

... **Capital spending** will show a drop to $335.1 million, down from $536.4 million.

... **An estimated 600 wells,** or fewer, were completed in 1959—less than half the 1958 total, and one-third the 1957 completions.

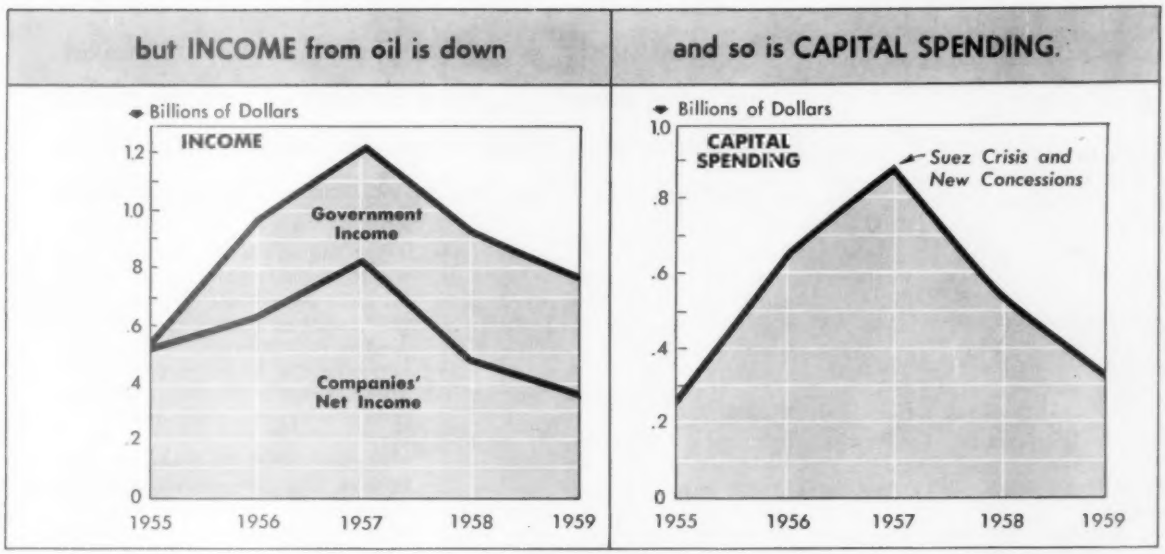
... **Refining is a bright spot,** with 806,000 bbl. daily processed the first 9 months, against 732,000 bbl. daily in 1958.

Activity down . . . Many Venezuelans find the sharp drop in drilling disturbing. Only 532 wells were drilled the first 9 months, compared with 1,290 wells a year, or more, for the preceding 4 years.

The government wants to limit reserves to conserve oil, as well as to stabilize income over a long period. But drilling needed to develop reserves is lagging, and the reserve increase in relation to production is declining.

Estimates are that in 1955 there was a net increase in reserves of 1.9 bbl. for each barrel taken out of the ground. By 1958 this ratio had fallen to 1.2 bbl.

This trend in the production-reserves ratio is considered alarming. Government projections show that re-



serves possibly may have hit the point of decline in 1959. But this may not happen until some time in the 1960's.

The decline in drilling and field work comes at a time when Venezuela is far from drilled out. Of the 6.07 million hectares (14.7 million acres) under concession, less than 8% is reported by companies as proved. Less than 6% of the total concession area is under exploitation.

Output up, income down . . . Crude production rose about 6% over 1958, which is considered in line with overall world demand increase. Output in 1959 came close to record production of 1957, when, stimulated by the Suez crisis, it averaged 2,779,200 bbl. daily.

Yearly output through December 23 averaged 2,768,500 bbl. daily.

The hitch is that profits have not gone up with production. Dr. Penaloza says it is not logical that crude prices should be down to the 1955-56 level, or lower, in the face of increased costs within the industry. Price rises 3 years ago coincided with the Suez crisis.

He attributes a drop of 15.3% in government income from the oil industry largely to a decline in income-tax payments, with returns from royalties and other taxes comparatively little.

When the government surprised everyone at the end of 1958 with a retroactive income-tax law that cost the industry an unexpected $176 million, Venezuelan oil's total income-tax bill for the year came to $444 million.

The industry's 1959 income-tax payments will be another story. Despite the breach of the 50-50 profit formula, which gives the government the big slice of a 60-40 profit split, operators will pay considerably less income tax. The total payments will be about $337.2 million, about the same as 1957, before the law was rewritten.

The balance of the $781.5 million the government looks for from the industry will come from $384.3 million in royalties, and $60 million from other taxes.

The new tax law has not prevented a sharp drop in government income in proportion to each barrel of production. The government has not said so, but pencil and pad arithmetic shows the government wound up with about 97 cents, and the industry about 51 cents for every barrel produced in 1958.

When the 1959 books are closed, Venezuela's income will work out to about 77 cents, and the industry's profit to about 37 cents for each barrel of output.

On an industry-wide basis, the government's share also has worked out in practice to more than a 60% of a 60-40 split. In 1958 it was about 66-34, and in 1959, about 68-32.

Capital spending has dropped each year since the peak in 1957, when payments for new concessions increased total company investments to $889.5 million. In 1958 the figure

How Activity Has Dropped Off in Venezuela

Year	Wells Drilled	Exploration Field Parties — Seismic	Gravity	Surface	Core Hole	Geochem.	Concessions (Million hectares)	Reserves — Oil Billion bbl.	Gas Trillion ft.	Reserves Added per Barrel Prod.
1955	1,290	192	34	127	16	. . .	5.87	12.43	23.30	1.9
1956	1,601	148	29	121	35	1	6.17	13.99	26.95	. . .
1957	1,824	261	45	108	41	5	6.69	15.59	29.02	. . .
1958	1,360	207	52	103	47	. . .	6.35	16.78	33.35	1.2
1959*	532*	60*	20*	65*	33*	. . .	6.08*	17.45†	35.68†	. . .

*9 months only. †Estimated.

dropped to $536.4 million. The drop in 1959 was to about $335.1 million.

The industry's net return on its total investment dropped to 12.8% in 1959, based on the first 9 months figures. This is a drop from a net profit of 16.8% in 1958, and from a high of 29.5% in 1957.

Exports to U. S. . . . One of the brightest spots in the Venezuelan picture is that exports to the U. S. have continued the same, or at a little better level than last year.

Despite import restrictions, operators sold 1,078,000 bbl. daily to the big North American customer the first 9 months of the year. The level is now undoubtedly greater with the advent of winter.

Rough for personnel . . . The slash in operations has hit many individuals as well as companies and the government.

Wide-spread staff reductions have been in progress for more than a year. In the first 8 months of 1959 alone, 350 U. S. technicians were released. This amounts to about a 7% cut. The list of separations is growing, and the total may now be 500 or more. Further separations may come after the new collective contract with Venezuelan workers comes into effect.

Many old hands have entered retirement. Others have resigned over dissatisfaction with policies they believe unfairly favor Venezuelan technicians. In the great majority of cases, however, employes are given their severance pay and that's it.

Virtually all operators have made cuts, with the exception of a few newcomers who are still expanding, and one established company that is opening a new refinery.

No Shows Yet in Puerto Rico

PUERTO RICO'S first oil test is inconclusive, and additional logging will be done in the 6,040-ft. hole.

David L. Gordon, Houston independent, said caving up the hole has required reaming. When this is completed a microlog will be taken. An electric log taken earlier was inconclusive.

The well, in south central Puerto Rico, is being drilled by a group of Texans headed by Gordon. Gordon said he will not know whether other wells will be drilled until a study of the logs and the paleontology of the cuttings is completed. There was no staining of the cuttings during drilling, he said.

France's Plan for Captive

• Administration's two-fold plan to control all marketing in the country and force Saharan oil onto the market is running into stiff opposition. De Gaulle may be forced to step in to end fight developing among cabinet members.

THE NEW French oil policy, designed to force a place in European market for French Saharan oil, shows signs of creating some real rifts in the administration of Gen. Charles de Gaulle.

The French oil industry has chaffed for weeks under the heavy hand of government pressure to take the light Saharan crude that's not suited to the French heavy fuel market. The industry has watched apprehensively as the government has moved to tighten its grip on French marketing and at the same time maneuvered to gain a preferred spot for Saharan oil in Europe's Common Market.

Last week the industry's discomfort had filtered both up and down. Up, it has developed a real split among the ministers in the De Gaulle administration. Down, it is being felt by a disenchanted Frenchman in the street who months ago scrambled to buy oil stocks and now sees them depressed by the government policy.

Opposition to the 'unifying" plans of the government has already forced some backing away from the grandiose plans for one big marketing organization in France.

Here's how things were shaping up last week:

. . . A new marketing company is being organized in France, designed specifically to handle Saharan crude, both in metropolitan France and in world-wide markets.

. . . Preferred or "umbrella" treatment for Saharan crude in other European markets is having tough sledding so far.

. . . Cabinet rift among the French ministers over the oil policy is now in the open. De Gaulle may have to step in and make a decision to keep his cabinet together.

. . . The French press and public are now taking part in what was once an under-the-surface struggle in the higher echelons of government.

Marketing company . . . The finishing touches are now being put on an entirely new French marketing organization which apparently will be less expansive in scope than originally planned.

Ste. Industrielle des Petroles (SIP) will have the French affiliate of Caltex as its cornerstone. Efforts to have SIP absorb an entire group of independent French refiners and marketers and bring the major part of French marketing under French Government control is apparently doomed to failure.

Nothing official has been revealed in Paris, but all reports indicate the ownership of SIP will be 40% Caltex with the remaining 60% divided between the official Bureau de Recherches des Petroles and the government-controlled companies, SN Repal, RAP, SNPA, and SPAEF.

Repal controls half the production in the big Hassi Messaoud field of the central Sahara. Regie Autonome des Petroles (RAP) owns 51% of CREPS, the joint French-Shell company which is developing four promising fields in the Edjele area of southeast Sahara. SPAEF has production in Gabon and SNPA at Lacq in metropolitan France.

None of the government-controlled companies has marketing facilities.

Arch rival of the new SIP will be Cie. Francaise de Petrole, the only French major company. CFP has the other half of the big Hassi Messaoud field and is privately controlled (in spite of a minority government interest).

CFP has a refining affiliate in France, markets in both France and North Africa under the brand name, Total, and also owns interests in Middle East oil.

The "unified" marketing company is the brainchild of Jean-Marcel Jeanneney, De Gaulle's Minister of Industry and Commerce. He is being closely backed in his plan by M. Guillaumat, Minister of Defense, who once headed BRP.

It was pressure from Jeanneney that prevented CFP from absorbing Omnium Francaises des Petroles, one of the larger independent French marketers which operates under the brand, Ozo. The French minister wants Ozo as a part of SIP, but that hardly seems likely now.

Also included in Jeanneney's plan was the independent, Antar Petroles

Market for Saharan Oil Hits Major Snag

de l'Atlantique which has a 45,000-bbl. refinery at Donges and a smaller plant at Merkwiller. The company has no production.

A third big independent, Des Marais Freres, markets more than 25,000 bbl. daily of motor gasoline through a network of service stations carrying the brand name, Azur. This company has no production or refining. Its products are purchased from the refining affiliate of CFP.

All in all, Jeanneney's plan included 21 independent French marketers, all of them customers of CFP. It appears the larger ones are holding out.

Caltex is tossing in the towel in France in joining SIP because it found itself boxed in by economics. The company has no French production and found itself forced into a rather small-scale refining and marketing position in which the whim of the government had control.

"This is industry, not philanthropy," a Caltex man commented last week in Paris. "We already have to refine, under the law, other companies' crude with hardly any profit. Since better profits are made on production and our group has tremendous potential production, we don't see why we should be generous and refine and market Saharan oil."

Umbrella for Sahara . . . Another of Jeanneney's projects that is being pushed hard, but apparently getting a cool reception, is preferential treatment for Saharan oil in the tariff-free Common Market.

The French minister has been working to have Saharan crude included among the articles which the six-nation Common Market group would accept without tariff. Jeanneney's plan would post a tariff on all other crude from outside the Common Market area and thus give the French Saharan crude a distinct cost advantage.

In Brussels recently, Jeanneney proposed that this umbrella cover domestic oil production in all the Common Market countries. None except France, which considers the Sahara part of France, can look forward to an exportable supply of oil.

Notable opposition to this plan came from Secretary of State Christian Herter and Douglas Dillon of the State Department at the recent Paris meeting of foreign ministers. The Germans have countered with offers of long-term purchase contracts.

Cabinet rift . . . An internal cabinet battle over Jeanneney's basic policies broke into the open last week when Antoine Pinay, French Minister of Finance and Economic Affairs, said publicly that De Gaulle was going to have to make a choice between him and Jeanneney.

THE MEDITERRANEAN seaport of Bougie on Algeria's northern coast is the jumping-off spot for the oil moving from the Sahara to Europe. Bougie is the terminus of a 24-in. crude line running from big Hassi Messaoud field (OGJ, Dec. 14, p. 66). A big fight which has split France's cabinet is centered around what to do with the oil now that it is available.

Pinay said publicly that he would have no part of a new "socialist" or "dirigist" (directed) policy in France's economic affairs.

Pinay is supported by a large segment of the French press and by Couve de Murville, French Foreign Affairs Minister.

The artillery is stronger on the other side. Jeanneney has the strong backing of Guillaumat and apparently the premier himself, Michel Debre.

Jeanneney is conceded to be a favorite of De Gaulle's. He is a former professor and an economist. His right hand and chief counsellor is Raymond Barre, regarded as the most brilliant economist of France's young school of economics.

De Gaulle will have to settle the issue, but last week there were indications that the once solid "unification" front was beginning to weaken under pressure of public and press opinion.

Members of the French cabinet supporting Jeanneney have started saying publicly that the plan for preferential treatment of Saharan crude in the Common Market is "only a suggestion." They point to this plan as a solution to the problem highlighted by the Suez crisis of 3 years ago.

At almost the same time, SN Repal made a statement in Paris that the new marketing company will have no special advantages in the national market. Repal said pointedly that the new company will operate on complete equality and competitively with the private marketers.

All this is being closely watched by the Frenchman in the street who a few months ago stood in line for hours waiting to buy new issues of oil stocks, 15 shares at a time.

Oil shares on the Paris Bourse represent more than 30% of the investment market. They have been depressed and lagging in activity since the Jeanneney plan was unfolded.

To top it all off, companies are telling stockholders dividends are not being distributed because the money must be retained to go into what they call "bad" business investments—petroleum products distribution.

New Trinidad Play

. . . on tap in Gulf of Paria by Kern Trinidad. Onshore work slated by Premier.

A NEW offshore drilling program is getting started on the Trinidad side of the Gulf of Paria.

Kern Trinidad Oil Fields has engaged Zapata Offshore Co. to drill an indefinite number of wells from a mobile barge on a 5,700-acre marine license. The first well will be located about 5,000 ft. offshore, and an equal distance from the southwest concession line. The second and third wells will be 7,400 ft. and 9,800 ft. from shore.

Kern Trinidad already has completed two exploratory wells in the gulf, drilled from shore-based locations. Christiana Oil Corp. has 15% net profit interest in the operation. Kern is a subsidiary of Rio Tinto Co.

Premier find . . . An onshore discovery in the East San Francique area on acreage held by Premier Consolidated Oil Fields, of London, has spurred plans for further drilling in the area.

Panoil Co., of Dallas, which has a management contract with Premier, plans to drill 12 wells early this year in the vicinity of a shallow discovery at East San Francique 4. The well has been completed from 800-830 ft., and flowed 250 bbl. of 23°-gravity crude in a 15-hour test through a ⅜-in. choke.

Tubing pressure was 150 psi., and casing pressure 310 psi. Three more shallow sands remain to be tested.

Panoil last year reexamined a Premier well drilled 30 years ago, and completed it as a 50-bbl. daily producer from 900 ft. The program on Premier's properties this year includes the start of a water flood in Fyzabad field, and eight development wells on properties the firm holds jointly with Texaco.

Reds Help Build Refineries

COMMUNIST China is the biggest benefactor in a Russian program to build or aid in the construction of refineries in other countries.

A new 20,000-bbl. plant at Lanchow, the biggest in the country, was built largely from Russian-supplied equipment. Another Russian plant is under construction at Shenyan, in northeastern China. It is called Fushun Refinery No. 2.

Russian shipments of complete units for oil installations, mostly on the refining side of the industry, will total 8,000 tons this year. This compares with oil-equipment exports of 3,000 tons last year.

In the last 12 years the Soviets have promised to deliver and supply technical help for 15 refineries with a total capacity of 300,000 bbl. for Communist-bloc countries. Less than 40,000 bbl. daily of this capacity is actually on stream at present.

Mobil Starts Nigerian Test

ANOTHER company has started drilling in Nigeria with a strat test in the southwest corner of the country near the Atlantic Coast.

Mobil Exploration of Nigeria spudded Afowo 1 after 4 years of preliminary exploration work. The company has 100% interest in licenses covering 2,500,000 acres in the western region of the country. The Afowo well is 3 miles from Badagri.

Mobil Exploration is an affiliate of Mobil International Oil Co. Another affiliate, Mobil Oil Nigeria, is the largest marketer in the country.

Successful exploration and development by the one other operator in the country, Shell-BP Development Co., has established Nigeria as one of the world's newest oil countries. Current output is about 15,000 bbl. daily. This level is expected to reach 30,000 bbl. daily by the middle of next year, and 40,000 bbl. daily by 1960.

FOREIGN BRIEFS . . .

Two coughs, and then . . . whoosh! That's the way Oil India, Ltd., described Nahorkatiya 48 as it came in on an initial flow test. The well flowed wide open at the rate of 5,500 bbl. daily. It is expected to make 600 bbl. daily through a ¼-in. choke on regular production. Production tests on Nos. 49 and 50 are in progress. The company is the successor to Assam Oil Co.

Two groups have offered to build a 10,000-bbl. refinery in Tunisia, at the Mediterranean terminal of a pipeline from the Edjele area of Algeria. The Italian state company, ENI, made one offer. A four-company group composed of Mobil Oil, Jersey Standard, British Petroleum, and Royal Dutch-Shell made the other. The pipeline will open this year.

Work will start about mid-year on a $35-million West Pakistan refinery to be built at Korangi, 6 miles east of Karachi. The plant will be completed in 1962 with a capacity of 32,000 bbl. daily. Its design will readily permit expansion to 42,500 bbl. daily. Downstream units will include a hydrotreater, and a cat reformer. Caltex, Stanvac, Shell, and Burmah Oil will jointly hold 60% interest. Private local sources will supply the rest of the capital.

Colon Oil Co. has formally sold its properties and business to Cia. Shell de Venezuela and dissolved. The company was the smaller of the two Royal Dutch firms operating in Venezuela. Its minority stockholders are being paid $35 per share, plus any higher amount that may be determined in a valuation by DeGolyer and MacNaughton, of Dallas.

Esso Petroleum is studying the possibility of building a 90-mile 10-in. products pipeline to London from its 244,400-bbl. refinery at Fawley. The company is looking at a 50-acre site south of London airport that might serve as the terminal for the system. The marketing firm, Shell-Mex & BP, has a products line to the airport area under construction.

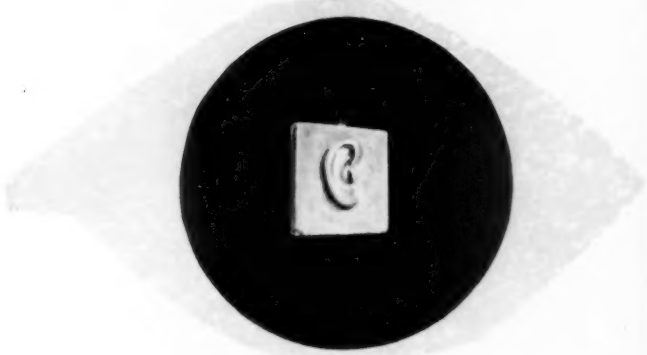
A French mining company, Soc. D'Etudes et D'Exploitation Minieres De l'Indochine, has obtained exploration permits in two areas of Laos. The acreage lies in Mekong valley in one permit and in the vicinity of Savannakhet in the other.

An Australian company, Oil Search, Ltd., is negotiating for exploration licenses in the Solomon Islands. The venture would be the first for the firm outside of Australian New Guinea.

Burmah Oil Co. (1954) plans to wildcat with two heavy rigs throughout 1960. One rig, owned and operated by Santa Fe Drilling, will drill in Lower Burma. Sites are being prepared at Pogaung and on the island of Kyun-Nyo-Gyi. The other rig, owned and manned by Burmah Oil, will drill in Central Burma. Plans are to first drill a deep test in Chauk field, followed by a test at Yedwet.

YPF will open bids February 10 for equipment and installation of a lubricating oil plant, gasoline processing, and reforming plants at its Campo Duran field.

HOW TO FIND OIL . . . by Schlumberger



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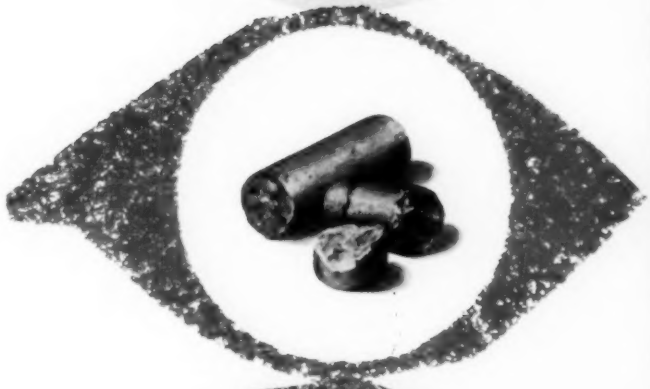

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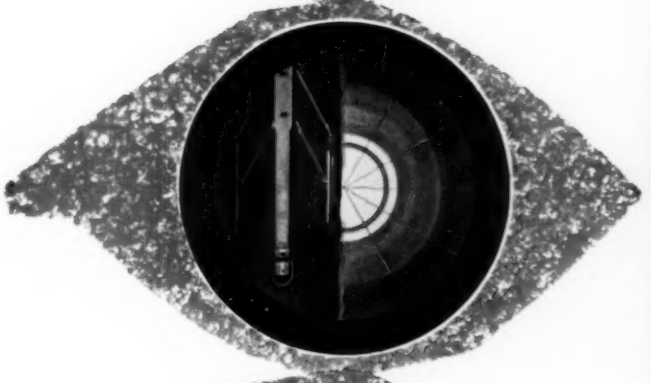

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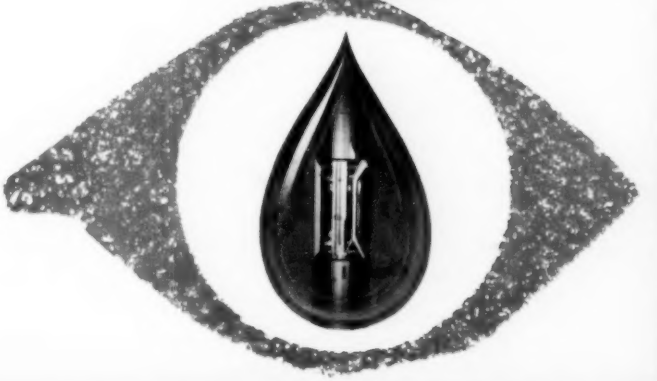

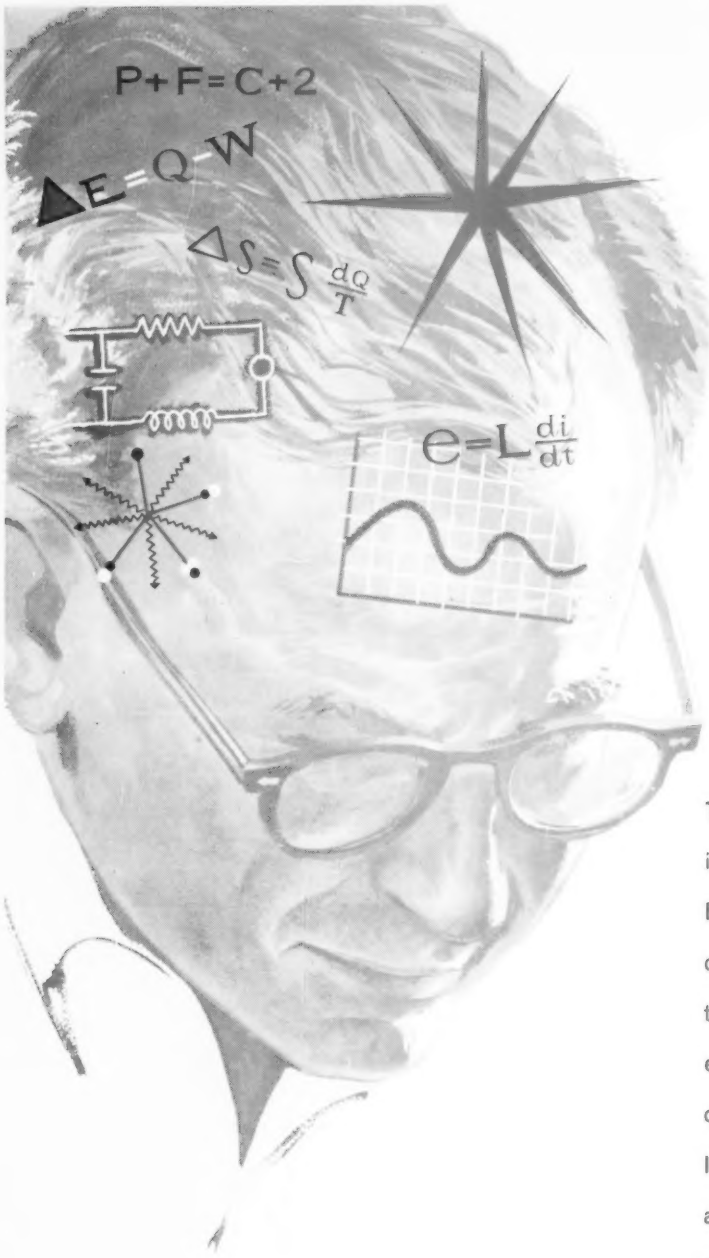

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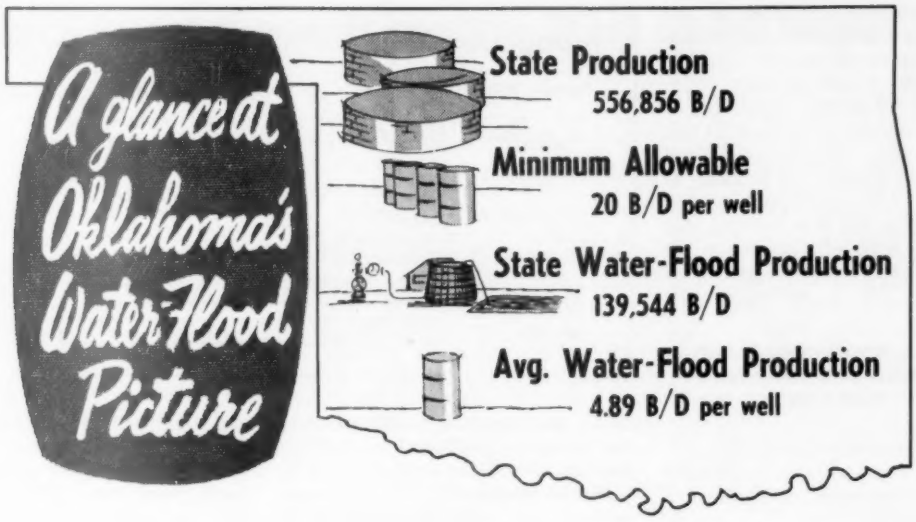


"Oklahoma's water-flood production should not be curtailed" says this engineer,

who backs up his conviction with some revealing figures

What is the impact of water-flood production on Oklahoma's total market? Is capacity water-flood operation glutting the market? Is it taking up an unfair portion of the state's total market? If water floods were prorated to normal allowable, at the risk of causing waste, how much would water-flood production be curtailed?

BY W. E. STILES
Petroleum Consultant, Tulsa

ALMOST without exception the principal water-flood producing states in the Mid-Continent area, Oklahoma, Texas, Kansas, and New Mexico, have allowed water-flood projects to produce at capacity (OGJ, Oct. 5, 1959, p. 156). In some of these states, short-term proration orders have been issued by the state regulatory body curtailing the production of water-flood oil. Usually these orders were rescinded upon presentation of data by water-flood engineers showing that water floods, to recover the greatest amount of oil, must be allowed to operate at optimum injection and maximum producing rates.

Reservoir engineers agree. Statewide hearings have been held in most of these states during the past several years to determine the necessity for unrestricted water-flood production. The preponderance of testimony presented in these hearings has shown that water floods must be operated without regulation to recover the greatest amount of oil, to prevent waste, and to protect correlative rights.

The opponents of unrestricted water-flood production argue that water-flood oil is taking too large a share of the market, resulting in reduced allowables for primary producing wells. The best way to answer that argument is to analyze the secondary-recovery production in the various states and determine the amount of oil over and above normal allowable that is being produced by the water floods operating at unrestricted rates of production.

In New Mexico, during a state-wide hearing before the Oil and Gas Conservation Committee in October 1959, data were presented showing the amount of water-flood oil being produced under unrestricted operations by the water floods in Texas, Oklahoma, Kansas, and New Mexico (OGJ, Oct. 26, 1959, p. 50). The testimony presented showed that in each of these states, the total amount of water-flood production in excess of the normal allowable given to wells of like depth, was less than 2% of the state's total production.

What about Oklahoma? An analysis was made of the monthly water-flood reports on file in the Oklahoma Corporation Commission records, for the month of May 1959.

In Oklahoma, water-flood projects may be initiated and operated only upon notice, hearing, and issuance of an order by the commission. The operator of each authorized project is required to file a monthly report with the commission, showing the area encompassed by each flood, the number of injection and oil-producing wells, the average daily volumes of water injected and oil and water produced,

and the operator's estimate of the maximum and minimum efficient rate of production of the project.

During the month of May 1959, any well in Oklahoma, regardless of depth, was allowed to produce 20 bbl. of oil per day, and all water-flood projects were allowed to produce at capacity. All of the reports on file were analyzed, and it is believed that all projects were covered, since the operator of a water-flood project is required to file a monthly report before the commission will authorize the crude-oil purchaser to run the production from the project.

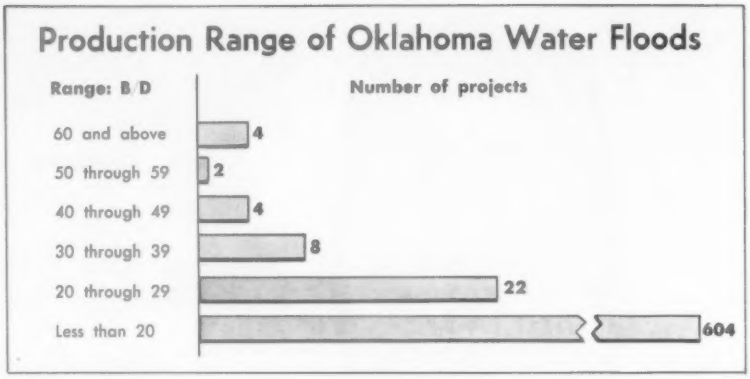


TABLE 1—SUMMARY OF WATER FLOODING IN OKLAHOMA, MAY 1959

Total state production, bbl. per day	556,856
Minimum allowable, bbl. per day	20
Water-flood production:	
Daily average	139,544
Per cent of total state production	25.06
Number of water-flood oil wells	17,136
Number of water-flood input wells	11,400
Total wells	28,536
Water-flood production; bbl. per day per oil well	8.14
Water-flood production; bbl. per day per total well	4.89
Number of authorized projects included*	643

*28 projects are not included; these projects did not report the amount of oil produced.

Floods studied. Reports were available on 671 authorized water-flood projects in Oklahoma. Of these projects, 28 had to be deleted because they failed to report the amount of oil produced during the month. All of the remaining 643 projects are included in the following analysis. It should be noted that 21 of these projects reported no water-injection wells.

As shown in Table 1, the average daily production of oil from all sources in Oklahoma was 556,856 bbl. per day. The amount of water-flood production during the month, from the 643 projects included in the analysis, was 139,544 bbl. per day, or 25.06% of the total state production. During the month there were 17,136 oil wells and 11,400 input wells in operation in authorized water-flood projects.

The average daily oil-producing rate of the oil wells in these projects was 8.14 bbl. per well and, if the total of 28,536 oil wells and input wells in authorized projects is used, the average daily oil production per total well was 4.89 bbl. It may be seen that although capacity water-flood production accounts for 25.06% of the state's total production, the average daily oil-producing rate per oil well, or per total well, in authorized water-flood projects is very low.

In Table 2, the water-flood projects have been grouped in accordance with the average daily rate of oil production per total well. As may be noted, **only 39 (6%) of the water-flood projects in the state operated at oil-production rates of 20 bbl. or more per total well per day;** while 94% of the projects produced less than 20 bbl. per day per total well.

Peak rate period short. It is probable that some of these 39 projects have just reached their peak rate of oil production—a condition, shown by experience to last for only a short while.

This is also a most critical period in the life of a water flood and any regulation requiring a reduction in injection rate and producing rate during this period is believed to cause loss of ultimate recovery and, hence, waste of a natural resource.

It is believed that state restriction

TABLE 2—WATER-FLOOD PRODUCTION IN OKLAHOMA—MAY 1959 (NO PRORATION OF WATER FLOODS)

Range—bbl. per day per total well—	No. of projects	No. of wells			Pipeline runs, May 1959		Prod. in excess of 20 bbl. per day per total well	
		Input	Oil wells	Total	Monthly	Daily per total well	Daily	Fraction of state total prod.†
60 and above*	4	2	9	11	22,144	64.9	494	0.0009
50 through 59	1	9	32	41	63,643	50.1	1,233	0.0022
40 through 49	4	8	29	37	49,934	43.5	871	0.0016
30 through 39	8	79	181	260	273,103	33.9	3,610	0.0065
20 through 29	22	276	714	990	755,939	24.6	4,388	0.0078
Less than 20	¶604	11,026	16,171	27,197	3,161,127	3.8	.....	.....
Total	643	11,400	17,136	28,536	‡4,325,890	4.9	§10,596	

*Highest daily rate of all Oklahoma water floods was 74 bbl. per day per total well. †Total state production during May 1959 averaged 556,856 bbl. per day. ‡Total water-flood production during May 1959 averaged 139,545 bbl. per day or 25.06% of state's total production. §This is 1.9% of total state production and 7.6% of total water-flood production. ¶94%.

"... only 1 flood in 15 produces more than 20 bbl. per well per day."

of water-flood production rate would affect only a small number of the floods at any one time, and those affected would be the few that, at that time, happen to be producing at the critical period of peak rate.

During the past several years the minimum allowable assigned to any oil well in Oklahoma usually was 20 bbl. per day. Those who propose that water floods be prorated usually agree that allocation should be assigned each oil well and input well in a project.

Assuming that such a proration plan had been imposed on water floods during May 1959 and that each oil well and input well had been assigned the minimum allocation of 20 bbl. per day, only 6% of the projects would have been affected and, as shown in Table 2, only 10,596 bbl. per day of water-flood production would have been curtailed. This amount is only 1.9% of the state's total daily production during the month. Thus, the imposition of the very minimum proration plan on water floods to curtail a small percentage of the project, at the risk of causing waste and loss of recovery, would result in only a small reduction in the amount of water-flood oil production.

Although 25.06% of the state's total production was produced by water floods, it cannot be said that water-flood production takes up an unfair share of the state's total market. These water floods, if prorated at the very minimum level in May 1959 would have produced 23.2% of the state's total production.

Only 1 out of 15. There are some opponents of unrestricted water-flood operation who are firm in their belief that large water-flood projects mean high oil-producing rates per well and that these large projects flood the available crude market with an inequitable share of the market. Table 3 ranks the 15 largest water-flood projects in operation in Oklahoma during May 1959, on the basis of the number of total wells in the project. It may be noted that, although some of the large projects delivered substantial amounts of oil to the pipeline, only 1 of the 15 produced in excess of 20 bbl. per day per total well. The small number of input wells and the large number of oil wells in this project would indicate a more reasonable classification as a pressure-maintenance project.

The third-ranked project in Table 3 is one of the largest pattern water floods and, although increased rate of development has maintained the rate of production during the last 18 months at the current rate, the average daily oil production per total well is still below the minimum allowable given any well in Oklahoma in May 1959.

Table 4 ranks the 15 highest-producing water-flood projects, on the basis of pipeline runs in May 1959. Note that only seven of these projects produced at rates in excess of 20 bbl. per day per total well although no state proration was imposed. These seven projects combined 7,416 bbl. per day in excess of the amount a 20-bbl. per day per total well proration plan would have allowed. However, as may be noted by the ratio of input wells to oil wells, four of these seven projects could more reasonably be classified as pressure - maintenance - type projects (as compared to pattern water floods in primary depleted reservoirs). The remaining three projects, by the ratio of input wells to oil wells, can reasonably be considered as pattern floods, and these three projects produced only 2,241 bbl. per day in excess of the assumed minimum proration plan of 20 bbl. per day per total well.

From the foregoing analysis of water-flood oil production in Oklahoma during May 1959 the following conclusions are evident:

1. Unrestricted water-flood production, while accounting for one-fourth of the state's total daily production, is not getting an unfair share of the total market.

2. Only a small percentage of the water-flood projects are capable of producing at rates above the state's usual minimum allowable.

3. If the minimum proration plan was imposed on water floods, at the risk of causing waste according to the preponderance of testimony by water-flood experts, the amount by which water - flood oil production would be reduced is only 1.9% of the total state production.

4. State restrictions of water-flood producing rate would accomplish very little. At any one time it would restrict the production from only a small percentage of the projects—projects which are perhaps producing at the short and critical period of peak rate.

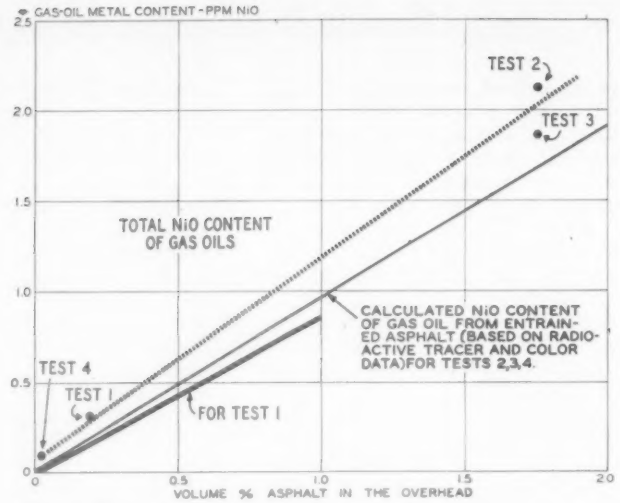
TABLE 3—LARGEST WATER FLOODS IN OKLAHOMA
(Based on Number of Wells)

Rank	No. of wells			May 1959 pipeline runs	Average daily prod. (bbl.)	
	Input	Oil	Total		Oil wells	Total wells
1	925	999	1,924	35,835	1.2	0.6
2	802	816	1,618	35,382	1.4	0.7
3	335	658	993	582,490	28.6	18.9
4	411	437	848	33,356	2.5	1.3
5	237	269	506	3,779	0.5	0.2
6	212	231	443	7,068	1.0	0.5
7	206	199	405	7,970	1.3	0.6
8	171	171	342	28,071	5.3	2.6
9	167	168	335	1,641	0.3	0.2
10	144	182	326	1,736	0.3	0.2
11	151	172	323	8,959	1.7	0.9
12	102	203	305	94,913	15.1	10.0
13	99	185	284	1,883	0.3	0.2
14	28	249	277	215,092	27.9	25.0
15	135	139	274	37,702	8.7	4.4

TABLE 4—HIGHEST PRODUCING WATER FLOODS IN OKLAHOMA
(Based on Pipeline Runs)

Rank	No. of wells			May 1959 pipeline runs	Average daily prod. (bbl.)	
	Input	Oil	Total		Oil wells	Total wells
1	335	658	993	582,490	29	19
2	28	249	277	215,092	28	25
3	51	185	236	203,319	35	28
4	54	56	110	117,821	68	35
5	102	203	305	94,913	15	10
6	63	77	140	91,416	38	21
7	28	111	139	65,151	21	15
8	9	32	41	63,643	64	50
9	63	133	196	63,446	15	10
10	88	72	160	59,547	27	12
11	5	55	60	59,057	35	32
12	33	71	104	57,199	26	18
13	37	71	108	55,162	25	16
14	20	40	60	52,417	42	29
15	28	96	124	50,443	17	13

Entrainment of vacuum-still bottoms in tower overhead streams can be effectively pinpointed through the use of radioactive tracers. Part 1, published last week, dealt with techniques of tracer use. Results of the entrainment studies are presented here in this concluding installment.



NiO CONTENT resulting from entrained asphalt, compared to total NiO content of the gas oil. Fig. 4.

Radioactive tracers pinpoint entrainment

PART 2 OF TWO PARTS

BY G. B. HOEKSTRA, A. I. SNOW, I. A. BAILLIE, AND J. S. CURTICE
Sinclair Research Laboratories, Inc., Harvey, Ill.

IN THE vacuum distillation of reduced crudes, gas oil is distilled from an asphalt-bottoms product. The gas oil is usually a clean, light-colored product unless it is contaminated with asphalt. The asphalt bottoms product is not vaporized, but may be carried into the overhead gas-oil stream because of entrainment.

The gas-oil product is feed for a catalytic cracking unit. A good feed stock contains a minimum amount of metals (especially nickel and vanadium which adversely affect both catalyst selectivity and life). Metals enter the gas oil by two routes: (1) by vaporization, since the metal compounds are somewhat volatile, and (2) by being entrained overhead with the gas-oil vapors. The elimination of entrainment can, of course, only eliminate the metals from the second.

The asphalt product contains metals in a concentration approximately 100 times that usually found in good gas oils. The large increase of metals content and color when small amounts of asphalt are added is shown in Figs. 4, 5, and 6. Vacuum-still construction and loading should be such that entrained asphalt is prevented from entering the gas-oil product.

The data presented in this article give some knowledge of the maximum vacuum-tower loading consistent with little or no asphalt contamination of the gas-oil product.

Tests were made on three refinery stills. Stills 1 and 2 were similar in size and design, but differed in entrainment-removal facilities. Still 1 contains two bubble trays and a demister pad. Still 2 contains three bubble trays. Still 3 contains a demister pad and two trays. The tray between the flash zone and the demister pad had no bubble caps. (Diagrams are given in Figs. 2 and 3, Part 1.)

Test results show that the demister pad is more effective than the bubble trays in removing entrainment. The demister is overlooked at a "C" factor of about 0.15 in Still 3.

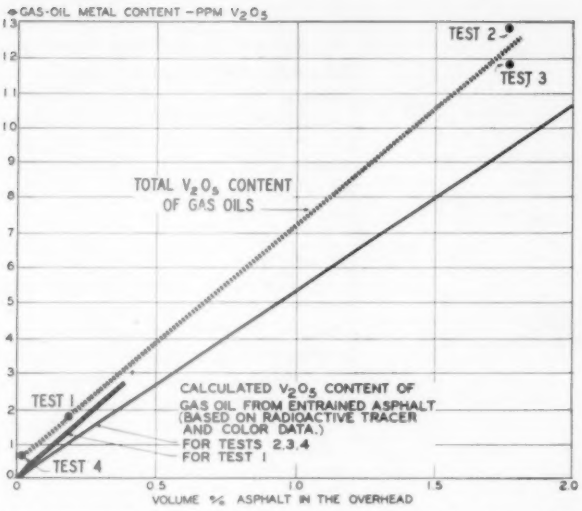
Still 1 . . . Six tests were made on this still. Test loadings varied from a flash-zone "C" factor of 0.061 to 0.114. Heater capacity limited the maximum loading to the "C" factor of 0.114. Counting of gas-oil samples showed fewer than 15 counts per minute per 800 ml. in nearly all samples. About 25 counts per minute per 800 ml. were detected in Test 8, and 18 counts per minute per 800 ml. in Test 9. These "counts" correspond to about 0.010% asphalt in the overhead in Test 8 and 0.013% runback in the overhead in Test 9.

The color, carbon residue (Ramsbottom method), and metals content (NiO, V_2O_5) of the gas oils do not vary with loading, for this still. This supports the tracer result of a constant (in this case, negligible) amount of entrainment at all loadings. Plots of the above inspections versus loading are given in Figs. 7 and 8. Results are tabulated in Table 1 of Part 1.

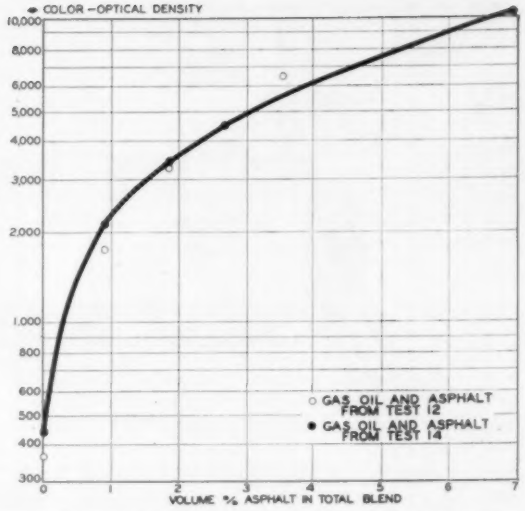
Still 2 . . . Five tests were made on this still. Test loadings were varied over a range of flash-zone "C" factors from 0.063 to 0.085. Tests were not made at higher loadings because entrainment was so high that the gas oil was black at the "C" factor of 0.085. In contrast with the gas oils from Still 1, Still 2 gas oils contained significant amounts of tracer. Entrained amounts of asphalt in the gas oil were 0.026, 0.19, and 1.76% at "C" factors of 0.063, 0.078, and 0.085, respectively. Results are tabulated in Table 1 and plotted in Fig. 9.

Gas-oil color, carbon residue, and metals contents of Still 2 gas oils increase with loading in a manner similar to the increase in entrainment with loading shown by the tracer method. Since the values of these inspections are directly related to the amount of entrainment, they confirm the entrainment amount as given by

Author Hoekstra is in the process-design division, and Authors Snow, Baillie, and Curtice the radiation division of Sinclair Research Laboratories.


GAS-OIL METAL CONTENT – PPM V_2O_5
TEST 2
TEST 3
TOTAL V_2O_5 CONTENT OF GAS OILS
CALCULATED V_2O_5 CONTENT OF GAS OIL FROM ENTRAINED ASPHALT (BASED ON RADIOACTIVE TRACER AND COLOR DATA.)
FOR TESTS 2,3,4
FOR TEST 1
TEST 1
TEST 4
VOLUME % ASPHALT IN THE OVERHEAD

V_2O_5 CONTENT in gas oil, resulting from entrained asphalt. Fig. 5.



COLORS OF BLENDS of gas oil and asphalt from Still 3. Fig. 6.

# of vacuum-still bottoms

the tracer in Table 1 and Fig. 9. The results are also plotted in Figs. 7 and 8.

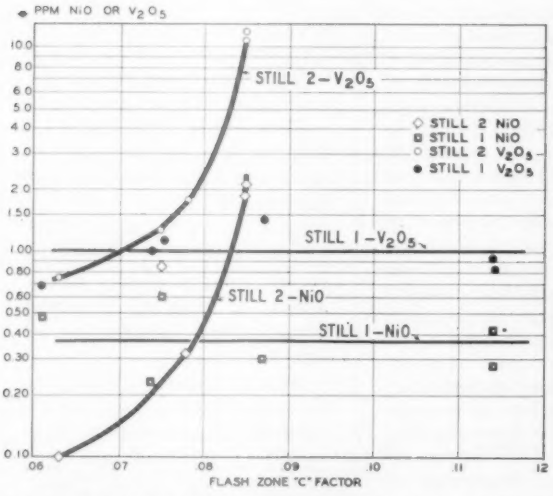
For example, the amount of entrainment in Test 2 ("C" = 0.085) was obtained by the color method. The method consists of the comparison of the gas-oil color from the still with the color of blends of asphalt and clean gas oils. The Test 2 gas-oil color was about 2,680 optical density.

The color corresponds to that of a gas oil containing 1.56 ± 0.18% asphalt. This checks the value of 1.75 ± 0.10% by the tracer method. Entrainment in Test 11 was also determined by the color method. Entrainment by color is about 0.10%. Entrainment by the tracer method at the "C" factor of 0.075 is read from Fig. 9 as 0.11%.

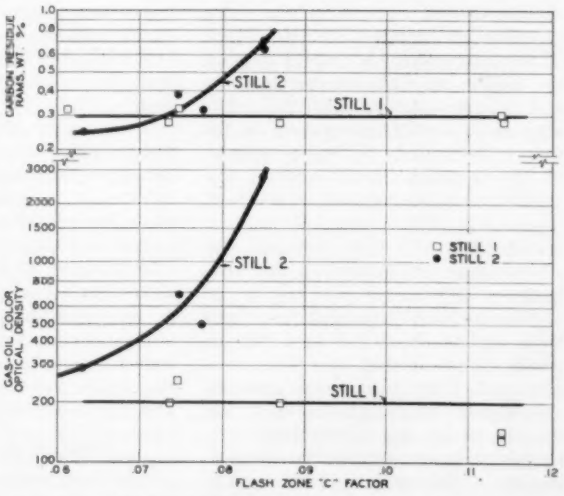
The metals content of the gas oil results from both volatility and entrainment. This is illustrated in Figs. 4 and 5. In the figures, dotted lines are drawn between data points of total gas-oil metal contents which are derived from the chemical analyses for nickel and vanadium.

Solid lines are drawn from calculated points representing the amount of nickel and vanadium carried into the overhead by asphalt entrainment. These calculations are based on the color and radioactive tracer data. The difference between these lines at a given asphalt concentration is equal to the concentration of metals entering the overhead by volatilization.

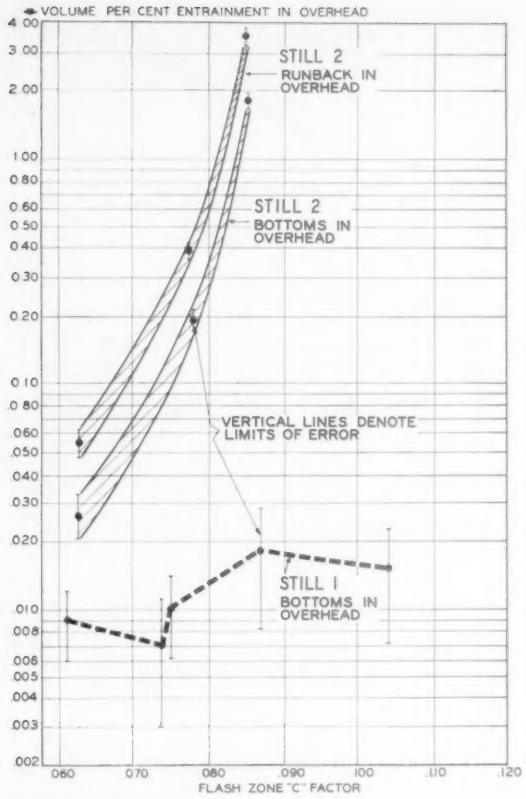
The increased divergence of these two lines in both figures as asphalt



NICKEL AND VANADIUM CONTENT of gas oils from Stills 1 and 2 as functions of flash zone "C" factor. Fig. 7.



GAS-OIL CARBON RESIDUE as function of flash-zone "C" factor. Fig. 8.



BOTTOMS OR RUNBACK entrained in overhead as function of flash-zone "C" factor. Fig. 9.

content increases indicates that fractionation efficiency decreases with increased loading. This is not an unexpected result, but is rather well shown in the figures. The figures show that metals from vaporization are 0.33 p.p.m. NiO and 3.0 p.p.m. V_2O_5 in Test 2 and 0.08 p.p.m. NiO and 0.65 p.p.m. V_2O_5 in Test 4.

Flash-zone entrainment consists of asphalt carried upward by the rising gas-oil vapor in the flash zone. Much of this entrainment is carried through the bubble-cap risers on the first tray and is deposited on this tray. The amount of asphalt entrainment on the tray is determined by tracer activity in the runback liquid and in the asphalt, and the amount of runback liquid. For Still 1—Test 7, "C" = 0.114, about 75 bbl. per hour of asphalt was entrained into the runback.

The runback consisted of about 94% asphalt. In Still 2 at a "C" = 0.085 about 40 bbl. per hour was entrained. These entrainment amounts are higher than expected and are thought to be due to the lack of a flash-zone baffle constructed so as to impart a downward velocity component to the vapor and liquid entering the tower.

Still 3 . . . The three tests made on this still were made at flash-zone "C" factors of 0.115, 0.146, and 0.156. The entrainment in the gas oil for the two tests at the lowest loadings was too small to detect (less than 0.02%). Entrainment in the highest rate test was about 0.97%. The demister pad was overloaded in the highest rate test. These tests show that the maximum loading of the demister pad for effective entrainment removal is a "C" factor of about 0.15. Results are tabulated in Table 2 of Part 1.

The amount of entrainment in the highest rate test was also determined by color. The gas oil had a color of 3050 optical density. Comparison of this color with the color of blends of asphalt and clean gas oil shows 1.7% entrainment. This value does not check the value of 0.97% obtained by means of the tracer.

This discrepancy is thought to be due to holdup at the point of injection and in the overhead accumulator. The effect of holdup is to prevent the concentration of tracer from reaching a steady state value if the test period is not long enough. The colors of the gas oil and asphalt blends are given in Fig. 6.

Summary

1. Results of this work show that radioactive cobalt naphthenate is an accurate tool in the determination of entrainment. Laboratory tests showed the tracer is essentially nonvolatile. Reversible adsorption of the tracer on the walls of the laboratory still was not detected.

2. Test results from two stills which are nearly identical except for internal design show that a demister pad permits much higher loadings before excessive bottoms entrainment in the overhead occurs. One still contains two bubble trays and a demister pad, the other still contains three bubble trays. At a flash-zone "C" factor of 0.085 on the still with no demister pad, entrainment in the overhead was 1.76%. At a "C" factor of 0.114 on the still with a demister pad, entrainment was less than 0.02%.

3. Test results from a still containing a demister pad show that the pad is overloaded at a flash-zone "C" factor of 0.156. At a "C" factor of 0.146 entrainment of asphalt in the overhead was less than 0.02%.

4. Entrainment amounts as determined by gas oil color comparison agree with the amounts as determined by the tracer method. Comparisons are 1.76 ± 0.10% by tracer — 1.56 ± 0.18% by color, 0.10% by tracer — 0.11% by color, and 0.97% by tracer — and 1.7% by color. The discrepancy between the last two values is thought to be due to holdup in the system.

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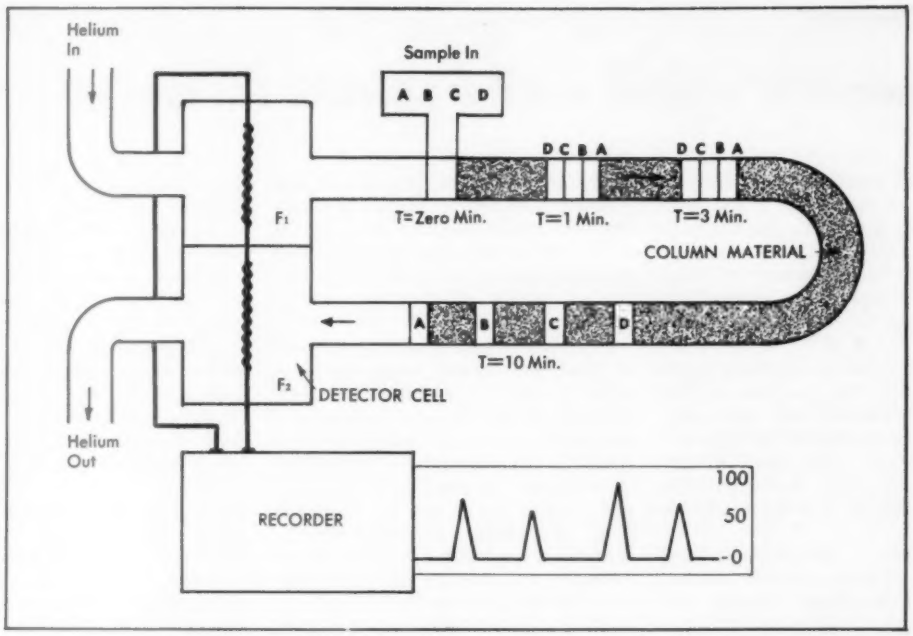


LABORATORY AND PROCESS chromatographs feature the same basic operation.

How chromatography can improve gasoline-plant profits

• Increase production • Meet quality requirements • Reduce costs

BY TOM MITCHELL
Arkansas Louisiana Chemical Corp.

PROPER SELECTION and application of chromatographs can result in increased earnings to plant operators through better quality control and reduced operating costs. To help in determining the need for one of these versatile analyzers in your plant, consider some of these applications.

- Analysis of finished product; maybe it's too pure. Revenue from a high-priced product can be increased by leaving in more of a lower-priced product.
- Control of fractionators to provide more stable operation, and better quality control of overhead and bottoms with less reflux.
- Rapid analysis of absorber inlet and outlet gas to set optimum lean-oil rate, thereby obtaining higher recoveries.
- Flue gases can be analyzed to help maintain more economical air-to-fuel ratios.

Paper presented at NGAA regional meeting, Tyler, Tex., 1959. Dixie Carter, Sunray Mid-Continent Oil Co., and Clint Teller, Arkansas Fuel Oil Corp., assisted in preparing the paper.

Once the need for a chromatograph has been established, the problem then is selection of the proper instrument. Here are some recommendations.

1. Contact other plants that use chromatographs for similar application.
2. Determine extent and availability of service from manufacturer or distributor.
3. Request manufacturer of unit in which you are interested to install one in your plant for a 30-day trial.

The advantages of the chromatograph in operating a gasoline plant are enormous. It can be used anywhere a quick, accurate analysis is needed. Both laboratory and process-type chromatographs have many uses.

Laboratory Instrument

Analyses of absorber inlet and outlet gases are needed to determine the correct balance of lean-oil rates to the plant units for optimum recovery. If the gas volumes and compositions do not change radically, one or two analyses per day using the lab unit will suffice to operate the absorbers efficiently.

Well streams . . . Analysis of well gas streams are needed to enable an engineer to properly evaluate the different economic processing techniques to use on the gas in question. The speed of the lab chromatograph will enable the chemist to give an analysis to the engineer within an hour after receiving the sample.

Suppose an engineer, with access to a chromatograph, needs to evaluate a gas field containing 8 wells. A competitor, with access to only a pod, is looking at the same field. Due to the speed of the chromatograph, the first

"No chemist is needed and the operator can read directly."

engineer will receive the analyses of the 8 wells at the end of 8 hours, or one working day, while his competitor will have to wait 4 days to receive the same 8 well analyses. A 3-day start on a competitor is obviously a big advantage.

Flue gas . . . The lab chromatograph will analyze the flue gas from heaters or boilers quickly and accurately. From this information, the operator can adjust the air-to-fuel rate for maximum efficiency, thus cutting the fuel consumption to a minimum.

End products . . . All products going to storage and sales should be checked to see if they meet specifications. You might find that the product is too good. To illustrate this particular application of the lab chromatograph, let's look at a gasoline plant which separates isobutane from n-butane. The plant's deisobutanizer column is far from being loaded. Therefore, the operation of the column is stable and very little trouble has been experienced with it.

The control tests consist of running vapor pressures and initial and 95% boiling points on isobutane and n-butane products. All tests have indicated good operation with no complaints on the products.

Samples were caught of the products and analyzed on a chromatograph. The isobutane was 97-99% pure and the n-butane product contained 6-8% isobutane. Specifications call for only 95% isobutane so immediately the operating conditions were changed. The plant is now making isobutane of 96-97% and n-butane of 99% purity.

Average production per day has changed from 15,000 gal. of isobutane and 25,000 gal. of n-butane, to 17,000 gal. of isobutane and 23,000 gal. of n-butane. Although the total combined butane production is the same, the value of the products has increased by approximately $14,600 annually. This is due to the higher price of isobutane.

Royalty tests . . . A future application of chromatography that should be considered is the replacement of the present charcoal-test procedures used in determining gasoline content of gas streams for royalty payment. Gas samples could be taken in the field and sent to a central lab for analysis. The chromatograph would give a complete analysis from which the gasoline content could be computed. It would be much easier, faster, and more accurate than the present charcoal method.

Process Instrument

The process instrument can be used in same applications as the lab unit. Why use the process instrument then? Actually, the process unit is only needed when close continuous control is needed. Since the process instrument is completely automatic, it can sample, analyze, and print the results in 5 to 20 minutes, depending on the sample. No chemist is needed and the operator can read directly and make adjustments accordingly.

By the use of close control, a quality product will be made or production will increase or the process cost will decrease.

Let's illustrate with typical or possible examples.

Quality control . . . To illustrate a quality-control problem assume a gasoline plant makes isopentane and its debutanizer column is loaded beyond its design capacity. The problem is to keep butane out of the isopentane and keep isopentane losses overhead to a minimum. To add to the problem, let's also assume the feed composition changes from day to day. What the operator needs is some means of telling him continuously how much butane is in the bottoms and how much isopentane is in the overhead. The process chromatograph comes to the rescue. Using it, the operator has the analysis of the two product streams every 10-20 minutes, thus enabling him to operate the column to its limit.

Saving in production . . . The literature is full of examples of using the process chromatograph to increase production due to close control of operating conditions.

Sunray Mid-Continent reported in the April 20, 1959, issue of The Oil and Gas Journal that a process unit installed at its Snyder gasoline plant saved $10,500 in 1 month. This unit monitors residue gas from two deethanizing absorbers and is also used to analyze three product streams.

Magnolia Petroleum Co., in the February 1959 issue of Refining Engineer, reported a savings of several thousand dollars a month due to the installation of a process unit. This problem was a common one. It was the operation of a deisobutanizer column in an alkylation unit.

Further, a process chromatograph has been used by Humble Oil & Refining Co. to analyze samples from four fractionation towers. These towers are being used to split isobutane from alkylate. The information made available by the process unit has enabled the operators to increase recovery of isobutane due to smoother operation of the towers. The economic credit for this smoother operation, along with the saving from reducing laboratory tests to 4 per day from 24 per day, has paid for the $15,000 worth of hardware in the analyzer and sampling systems in about 90 days. This was reported in the October 5, 1959, issue of The Oil and Gas Journal.

Reducing operating costs . . . Up to this point the main emphasis has been in increasing production or meeting the quality requirements. Now let's see how we can reduce some of the operating costs.

Suppose you have just completed building a plant and it is operating below capacity since it was designed for a greater future load. There are no quality problems or production problems. Why do you need a process chromatograph then? For every g.p.m. of reflux used in the fractionating columns it costs roughly $70 per year in fuel costs. Therefore, if you could reduce the reflux over your depropanizer, debutanizer, deisobutanizer, deethanizer, and deisopentanizer by a combined 50 g.p.m., the process costs would be reduced by approximately $3,500 per year.

An additional benefit would be that reducing the reflux rates would also reduce the load on your cooling-water system. To enable an operator to reduce reflux to the fractionating towers, there must be an analyzer to continuously monitor the product streams. Otherwise, he will tend to be always on the safe side by using more reflux than is really needed.

How to Select a Chromatograph

To familiarize you with the basic operation of this analytical instrument, consider the accompanying schematic flow diagram. This flow diagram will be basically the same for both the lab and process instruments.

"If you aren't sure of your need, try a 30-day free trial."

A sample containing components A, B, C, and D is introduced into the column through a sample valve. A carrier gas, usually helium, nitrogen, or hydrogen, is used to sweep the sample into a column containing an inert solid coated with a very low-vapor-pressure liquid. Due to sample components having a different affinity for the column packing, the carrier gas sweeps the various components, A, B, C, and D through the column at various speeds. Thus, if the column is long enough, the various components will completely separate. The concentration of each component is then measured by the sensing side of the detector before passing to atmosphere. The two dectector cells are part of a bridge circuit of which the unbalance is constantly measured by a standard recorder.

Laboratory Unit

In selecting a laboratory chromatograph, you should consider what is expected of the instrument now and what will be expected of it in the future. There are basic instruments on the market today which will analyze gas samples (and LPG) from methane through the pentanes, hexanes, and heavier.

With the proper column, it is also possible to separate some of the inerts on these basic instruments. Some of these instruments lend themselves to easy modifications. For the smaller natural-gasoline plant this instrument is all that is needed. For the larger laboratory, which might be involved in a larger variety of samples and possibly research, a more deluxe instrument with additional gadgets would be recommended.

After reaching a decision on the application of this instrument, you must then try to decide which of the instruments on the market you should buy. Before selecting this instrument, I would like to suggest the following:

1. Contact other plants that use chromatographs and discuss with them the merits of their equipment. Determine from them the maintenance required, the caliber of service given by the manufacturer, the precision and accuracy of the unit, and whether they would recommend the instrument.

2. Next analyze your manpower situation. If you have a capable chemist and good instrument man, you may not have to depend on the manufacturer for service. If you don't have the manpower, be careful in selecting your equipment since some manufacturers give very poor service.

To further explain, most manufacturers state that a high-school graduate can operate their equipment. This is basically true because the operation of a chromatograph is very simple. The fallacy in this claim lies in the fact that there are a number of variables, any one of which will keep the instrument from operating properly. To be able to locate and correct the cause of these difficulties requires a thorough knowledge of the problems of chromatography and instrumentation.

If your laboratory personnel do not have such knowledge, you should have it available through the manufacturer of the instrument or his distributor. A definite understanding concerning such service should be obtained before the purchase of the instrument.

3. Examine the power available at the proposed location of the instrument. If you generate your own power, chances are you can't control the cycles in the range required by the manufacturer. If your power varies more than one-tenth of a cycle, you had better count on going to commercial or a battery source of power.

4. Further, it is suggested that your laboratory personnel contact the NGAA Subcommittee on chromatography for any recommendations on possible changes in its procedure for analysis by chromatography. This will enable your laboratory to be up to date on the recommended NGAA procedures.

Process Analyzers

The previously stated suggestions on the laboratory unit will also hold true for the process unit but since the process unit is much more specialized, these additional points should be considered:

1. Since these instruments are usually custom designed to the customer's specifications, and while some modifications can be made in the field, it is generally wise not to try to analyze every stream in the plant on the same machine. If multiple streams are to be analyzed on the unit, locate the analyzer module in such a manner that the time lag due to the length of the sample lines will be a minimum.

2. Do not try to analyze several gaseous streams and a heavy liquid stream on the same unit. The required operating conditions will not be the same.

3. If you are not sure of your need for a process unit, some manufacturers will install a standard-design unit in your plant on a 30-day-trial basis. Then, if you are not satisfied, the unit is returned and the only cost is the portion of the sample system that you cannot salvage. This, to me, is the best way to determine whether a process unit will benefit you—try it out.

Next Week: Estimating Heat Exchangers

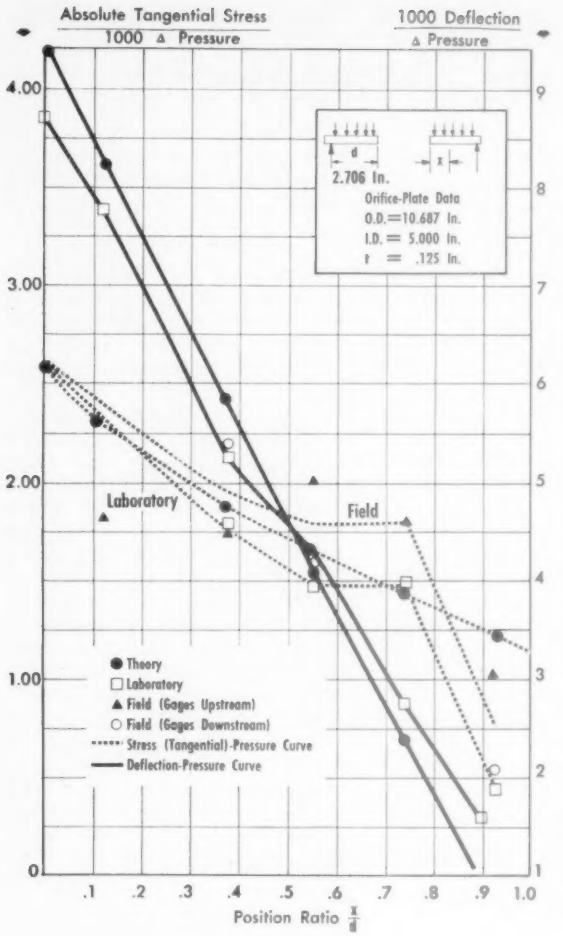
A NEW, fast, and accurate method for estimating heat exchangers will be outlined for processors in a special 20-page report in next week's Oil and Gas Journal.

The method is based mainly on the use of simple charts which should handle at least 90% of the heat transfer requirements of a refinery or natural-gasoline plant.

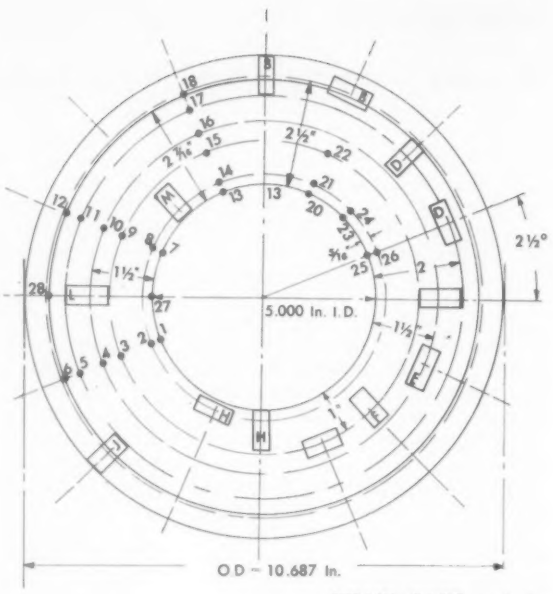
The special report will break down into five different parts:

- Heat balance.
- Mechanical design.
- Basic heat transfer equation.
- Film coefficients.
- Pressure drop.

Watch for this important Journal report next week—January 18.



COMPARISON of theory, laboratory, and field tests is made from chart on which average test values have been plotted. Fig. 1.



STRAIN GAGE and deflection-measurement-point location. Fig. 2.

Tests shed light on

Orifice-plate bending

Lab results indicate that for all practical purposes, the orifice plate in orifice fittings acts as a uniformly loaded plate with a central hole simply supported at the outer edge; field tests followed the same pattern.

BY STANLEY P. BELONOS AND ROBERT W. DAVIS
Columbia Gas System Service Corp.
Columbus, Ohio

ON SEVERAL occasions deformed or buckled orifice plates have been found in orifice meter tubes. This deformation is thought to be the result of excessive pressure differentials across the orifice plate which might occur during the first stages of placing the meter tube in service. Primary concern was with orifice plates in orifice fittings which were considered to be simply supported. An investigation of the theoretical and actual stresses on the orifice plate in a fitting under flowing conditions was made.

The preliminary work in determining the stress and deflection in the orifice plate was done in the laboratory using a modified orifice flange to simulate a fitting and field conditions. Similar field tests were made using an orifice fitting as installed on a meter tube. The significance of the method of the orifice-plate support and resulting orifice-plate deflection is evident when one realizes that orifice-plate flatness is a criterion of gas measurement.

Conclusion

The laboratory results indicate that for all practical purposes, the orifice plate in orifice fittings acts as a uniformly loaded plate with a central hole simply supported at the outer edge. The results of the field tests followed the same pattern.

The stresses developed during the

TABLE 1—MAXIMUM ALLOWABLE PRESSURE DROPS FOR ORIFICE PLATES* IN ORIFICE FITTINGS

Orifice plate dimensions, in.			Maximum allowable pressure drop before yielding, psi.	Maximum orifice plate deflection before yielding, in.
O.d.	I.d.	Thickness		
12.593	6.000	0.125	9.7	0.185
	4.000	0.125	7.5	0.165
	3.000	0.125	6.9	0.149
10.687	5.000	0.125	13.5	0.130
	2.000	0.125	9.2	0.099
8.437	4.000	0.125	21.6	0.083
	2.000	0.125	15.4	0.067
6.437	3.000	0.125	37.4	0.047
	2.000	0.125	29.2	0.042

*Chart based on 316 stainless steel with a yield strength of 35,000 psi.

TABLE 2—MAXIMUM ALLOWABLE PRESSURE DROPS FOR ORIFICE PLATES* IN STANDARD ORIFICE FLANGES

Orifice plate dimensions, in.			Maximum allowable pressure drop before yielding, psi.	Maximum orifice plate deflection before yielding, in.
O.d.	I.d.	Thickness		
16.625	6.000	0.125	30.7	0.044
	4.000	0.125	22.3	0.072
	3.000	0.125	20.5	0.080
14.250	5.000	0.125	43.2	0.031
	2.000	0.125	29.8	0.062
12.125	4.000	0.125	68.7	0.019
	2.000	0.125	46.0	0.036
9.875	3.000	0.125	99.0	0.014
	2.000	0.125	78.8	0.021

*Chart based on 316 stainless steel with a yield strength of 35,000 psi.

field tests were slightly higher for the same pressure drop as used in the laboratory tests, signifying that the laboratory pressure drops did not produce as intense a behavior pattern as field pressure drops. The effect of a different mass flow may account for this.

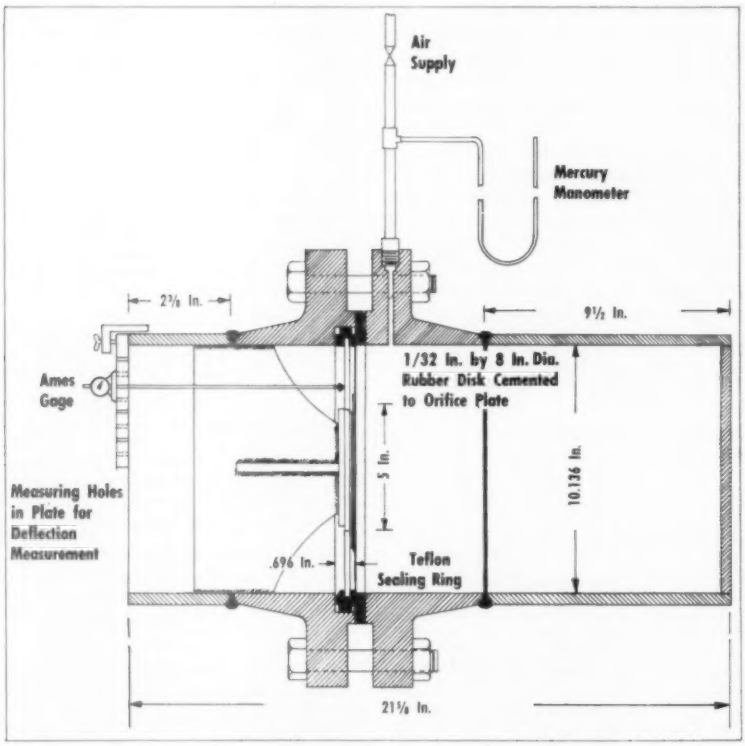
The teflon or rubber ring holding the orifice plate undergoes compression, thereby displacing the orifice plate in the direction of flow. The value of this displacement is recorded on Table 3.

The averaged test values have been plotted and are shown in Fig. 1. The figure is a comparison of theory, laboratory, and field tests. Table 1 lists the theoretical maximum allowable pressure drops across various size orifice plates and the corresponding deflections to be expected before buckling or permanent set occurs. Table 2 lists the same values for an orifice plate in standard orifice flanges as a comparison. There is a substantial difference in the pressure drops producing the deflection between the two methods of plate support. The orifice flange has a plate which is rigidly supported while the orifice fitting plate is simply supported.

An orifice flange was fabricated, as shown in Figs. 3, 4, and 5, to simulate the conditions of plate support and mounting as found in an orifice fitting. Strain gages (type A-7) were mounted on a 10-by-5-in. orifice plate, as shown in Fig. 2. Holes which were drilled in the end plate for measuring deflection match the solid numbered dots shown in Fig. 2.

TABLE 3—GASKET COMPRESSION MEASUREMENTS FOR TEST PLATE

Differential pressure psi.	Gasket compression inches
One	.0035
Two	.0070
Three	.0112
Four	.0137
Five	.0162
Six	.0180
Seven	.0197
Eight	.0210
Nine	.0215
Ten	.0230



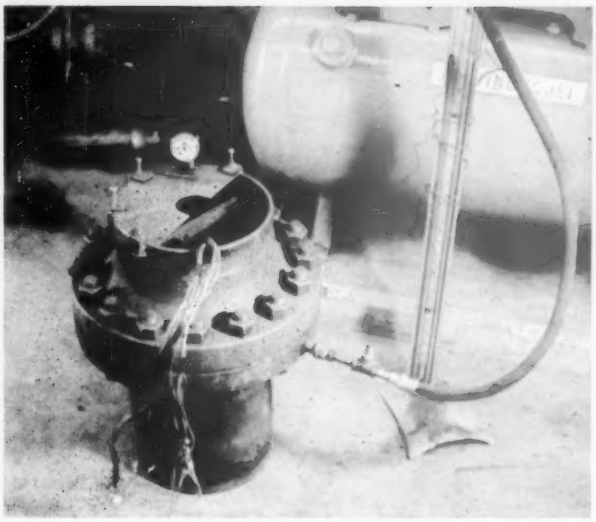
SIMULATED orifice fitting. Fig. 3.

Various pressure differentials up to 10 psi. were applied across the plate and with the use of strain-gage equipment and an Ames gage, the strains and deflections were recorded. The plate was then tested under field conditions with the strain gages located on one face of the plate. Gas flow was reversed instead of the plate to note the changes in stress on each face of the plate.

In making the field tests with strain gages attached to the face of the plate, downstream-flow direction, the gage leads were broken off due to the velocity of the gas across the leads at the higher differential pressures. Therefore, when the gages were in this position, full-range readings could not be taken to make comparison with those obtained in the laboratory tests.

Explanation and Interpretation

The comparison of field and laboratory test data is shown in Fig. 1. A ratio of the distance from the inside edge (x) to the distance from the cen-



TEST SETUP is shown. Fig. 4.

SIMULATED orifice fitting and plate. Fig. 5.

ter of the simple support to the inside edge (d) was plotted on the abscissa (position ratio).

Ratios of the absolute tangential stress divided by 1,000 × pressure drop and 1,000 × deflection divided by the pressure drop were plotted on the ordinate. The value plotted at each point is the average of all values at each of the various pressure drops. The deflection values used from the laboratory tests do not include the gasket compression.

In order to plot the theoretical stresses and deflections across the plate, the general expressions for stresses and deflections along a uniformly loaded, simply supported plate with a central hole had to be derived. The derived equations used are:

$$\delta_x = \frac{px^4}{64D} - \frac{pb^2x^2}{8D}(1\ln x - 1) - \frac{C_1 x^2}{4} - C_2 \ln x + C_3$$

$$S_x = \frac{p}{t^2}\left[- 0.3750\, x^2 (1 + 3\mu) + 1.5000\, b^2 (1\ln x)(1 + \mu) - 0.7500\, b^2 (1 - \mu) + \frac{3\, C_1 D (1 + \mu)}{p} + \frac{6\, C_2 D (1 - \mu)}{px^2} \right]$$

For the test plate:

$a = 5.206$ in.
$t = 0.125$ in.
$\mu = 0.3$

$$C_2 = \frac{32.6189\, p}{D}$$

$D = 5{,}079.6$
$b = 2.500$ in.
$E = 28.4 \times 10^6$ psi.

$$C_1 = \frac{3.8989\, p}{D}$$

$$C_3 = \frac{82.5139\, p}{D}$$

δ_x and S_x are the formulas for the deflection and tangential stress along the plate. The subscript x denotes the location from the center of the plate.

The laboratory and field-stress pressure curves are close enough to indicate that, at least for the present, the formula for a simply supported plate may be used for orifice plates in orifice fittings. Further tests would be necessary for any correction of the formula for use of field pressure drop for uniform load in the formula. This correction could be made by tests on various plates with strain gages at the plate's inner edge since we know the plate acts as a uniformly loaded simply supported plate with a central hole.

References

1. S. Timoshenko, Strength of Materials, Part II, Advanced Theory and Problems, D. Van Nostrand Co., Inc., New York, second edition, twelfth printing, March 1951, pp. 135-138.
2. W. E. Trumpler, Jr., "Design Data for Flat Circular Plates with Central Holes," Design Data and Methods—Applied Mechanics, ASME, 1953, pp. 26-28.

BOOKS

PHASE RELATIONS OF GAS-CONDENSATE FLUIDS, VOLUME 2. By C. Kenneth Eilerts and others. Published by American Gas Association, 420 Lexington Avenue, New York 17. 545 pp. $15.

This is the second part of a monograph on phase relations of gas-condensate fluids. This second half deals with correlations of test results and component properties.

From the beginning of the project on which these volumes are based, all experimental investigations were planned to accumulate data suitable for correlations. Reliable means were sought for calculating answers to future engineering problems after a minimum of special testing in the field and laboratory.

The term of the project of determining significant properties of gas-condensate fluids has included three distinct periods: Field and laboratory measurements; correlation of all available data; and reporting the results so that they can be used by industry.

In preparing both volumes of this monograph special attention was given to correlation, so that the considerable quantity of data that were available could be assimilated in generally applicable relationships useful to industry.

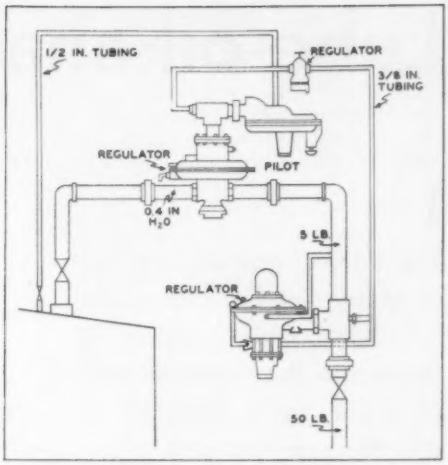
THE EVOLUTION OF NORTH AMERICA by Philip B. King. Published by Princeton University Press, Princeton, N. J. 190 pp. $7.50.

Dr. King, one of the world's leading structural geologists, has a well-written discussion of the structural aspects of North America. Amply fortified by an abundance of diagrams, cross-sections, and maps (nearly 100), he tells how the continent was formed, what it has been, and what it is now.

The major regions are reviewed separately, and the physiographic features are outlined as he brings together the results of recent data in the fields of geology, geophysics, geochemistry, and geography.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

Pilot regulator improves operation of Shell's gas-blanketing system



PRESSURE change of about 0.1 in. of water will actuate this pilot-regulator combination.

GAS BLANKETING of storage tanks is being used in many plants as an effective means of preventing oxidation of stocks in storage. One of the common operating problems involved in the operation of such systems is the choice of control methods for maintaining positive pressure on the tanks.

Shell Oil Co., Houston, found its solution to be in the use of a pilot regulator operating in conjunction with a standard pressure regulator. The combination provides enough sensitivity to maintain the low-pressure gas blanket plus enough capacity to provide large quantities of gas to compensate for sudden changes within the tanks.

In addition to insuring that stocks will not be unduly exposed to atmospheric oxygen, the installations curtailed the amount of gas necessary to maintain satisfactory blankets. Effectiveness of the pilot regulators is verified by laboratory analysis of stored stocks. Before use of the modified regulator systems, and with gas blanketing, oxygen was present in samples analyzed. Since the change no measurable oxygen content has been discerned in routine analyses.

Shell has installed gas-blanketing facilities on a number of storage tanks. Most of these are used to handle naphthas. Some smaller tanks are in aromatics and phenol services. In all, 27 tanks are gas-blanketed. These range from 100-ft.-plus-diameter tanks to some as small as 10 ft. in diameter (phenol). Natural gas is used for blanketing.

Six large tanks in service in the company's thermal cracking department, primarily in naphtha service, had been consuming about 150,000 s.c.f.d. of gas with the old blanket system. This has been cut to an estimated 50,000 s.c.f.d.

Gas consumption has also been reduced in the firm's aromatics department tanks, which includes some in naphtha service, some in aromatic-products service, and some phenol tanks.

Twenty-one tanks are blanketed in the area along with the reforming unit and aromatics concentration-unit accumulators. Gas consumption for these installations, with modified regulators in use, comes to an estimated 650,000 s.c.f.d.

A reduction of 100,000 s.c.f.d. was experienced in converting the regulators on four 45 by 40-ft. tanks handling reformates and toluene and benzene concentrates.

Design considerations . . . One of the prime considerations in a gas-blanketing installation is to not interfere with normal tank-breathing systems, yet provide makeup gas as compensation for changes in the vapor space within a tank. While pumpout rates have to be considered, changes due to ambient-temperature conditions are the most critical. A sudden rainstorm, for instance, can cause a vacuum to exist. This is undesirable and can be aggravated by use of standard pressure regulators lacking in sensitivity.

Sensitivity is important, for a slight positive pressure must be maintained which is somewhat less than the conservation-vent actuating valve. This positive pressure due to the gas blanket may range from slightly above atmospheric pressure to 0.2-0.3 in. of water below the conservation-vent actuating pressure. This cushion of 0.2-0.3 in. of water is made as a precaution against early opening of the conservation vent.

Another factor which can affect the margin is the conservation-vent blowdown characteristic. The pressure pilot opening pressure in most cases is either 0.75 or 0.87 in. of water depending on the manufacturer. It is necessary that the minimum regulator sensitivity be 0.5 in. of water to satisfy the above requirement. This sensitivity denotes the pressure change required to stroke the regulator from fully closed to fully open.

The natural gas used at Shell's Houston refinery is stepped down from a 50-psig. pressure to 5 psig. for use in the gas-blanketing system. In the initial installations, self-operated pressure regulators were installed rather than instrument-actuated systems. The remoteness common to tank farms makes simplicity and maintenance-free operations important criteria in any installation. The comparative cost also was a factor in selection of the self-contained regulators.

Unfortunately, difficulties were experienced with the regulated pressure vs. capacity characteristics. Pressure drop due to gas flow in the piping to the storage tank might influence the performance of the regulator. Modifications eliminated this problem. This included piping the diaphragm reference pressure to an internal eductor tube and also to a remote reference connection. Neither of these was satisfactory.

Pilot-actuated regulators were then installed. The mounting includes a standard regulator tied into the main gas flow into the tank. One-half-inch tubing connects the tank directly to the pilot regulator (Fig. 3). Changes in internal tank conditions actuate the pilot, which in turn actuates the regulator providing proper gas movement to the tank. The pilot-regulator combination has a sensitivity of approximately 0.1 in. of water. In making the installation it's important to put the pilot regulator upside down. This keeps the tank's pressure from having to overcome the weight of the diaphragm.

Acknowledgments . . . Cooperation of the management of Shell Oil Co. in the release of this information and the assistance of Jim Byerly and Cecil Farrington in the compilation of information and data are gratefully acknowledged.

Lube-oil analysis

. . . a practical tool in preventive maintenance

The natural-gas department of Mobil Oil Co. started its lube-oil-analysis program 9 years ago. It has proven very practical as a preventive-maintenance tool and is becoming more valuable as experience grows.

BY WILLIAM E. SCRUGGS
Mechanical engineer,
Mobil Oil Co.

ANALYSIS of lube-oil samples taken from engines and turbines can be a lot of help in a preventive-maintenance program. Experience has proved that the condition of the oil is determined by the condition of the engine or turbine in which it is used.

Proper sampling, testing, and interpreting the results can indicate the proper time for oil changes and help pinpoint the troubles when equipment is malfunctioning. The standard tests and their significance are:

Viscosity. Increase in viscosity usually caused by oxidation or contamination by products of combustion.

Water, percentage by weight. Water content should be nil, could possibly come from water leaks or products of combustion.

Neutralization number. Increase in this value indicates oxidation and could be caused by blowby or high temperatures.

LUBRICATING OIL DATA SHEET

FOR MONTHS OF _____

SUBJECT: LUBE OIL SAMPLE SHIPMENT
Following are data on lubricating oil samples shipped this date from _____ Gasoline Plant to the Natural Gasoline Laboratory for Testing:

Sample Number			1	2	3	4	
Sample From Engine No.			E-1	E-2	T-2	T-3	
Date Sample Taken			9-9-59	9-9-59	9-9-59	9-9-59	
Type Engine			GMV-10	GMV-10	G.E. Turbine	G.E. Turbine	
Type Oil			M-4D	M-4D	T-MH	T-MH	
Tests to be Made			Std.	Std.	Std.	Std.	
Operating Hours Since Oil Change			10,013	8,000	56,000	59,000	
Engine Temperature, °F	Water Jacket	In	140	160			
		Out	150	170			
	Lub. Oil	In	120	155	140	148	
		Out	130	165	143	154	
Type Filter	Filter Material		-Cotton &	Rayon-	Paper	Paper	
	Manufacture		Hilco	Hilco	Hilco	Hilco	
Date Filter Changed			8-11-59	8-11-59	8-11-59	8-11-59	
Place Where Sample Taken			Oil Return Line	Oil Return Line	* Sump	Sump	
Remarks:							

The above samples were taken by _____ Yours very truly,

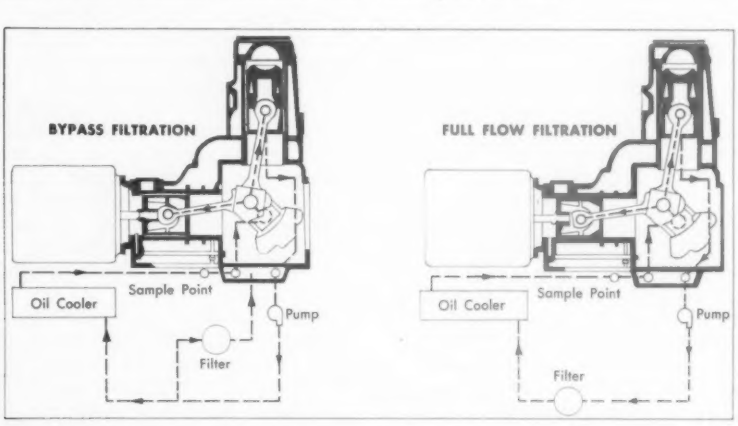
CERTAIN PERTINENT DATA are taken at the time of sampling. Here's a sample data sheet. Fig. 2.

Lube oils are very complex compounds and may contain several thousand different types of molecules. Many of these molecules are known as unsaturates; that is, the molecular structure is incomplete or very unstable. This type of molecule often changes its form completely when stabilized under heat or pressure conditions. This new form may be a varnish, gum, or resin.

Oxidation of the oil also takes place under certain conditions, resulting in the formation of free carbon. During this oxidation hydrogen is liberated which combines with other compounds to form fatty acids. None of these new forms are lubricants and the fatty acids readily attack equipment parts.

Apart from internal changes, contamination from foreign materials such as water, dirt, blowby gases, excess fuels, and metal particles worn from the equipment may render the oil useless or unsafe for lubrication.

These conditions do not exist in a properly operating engine. Therefore, it is not the lube oil that causes the engine to fail, but conditions in the engine that cause the oil to fail.



TWO TYPICAL large-horsepower-engine lubrication systems. Point of sampling is the oil-return line to the engine. Fig. 1.

Sampling. One of the most important steps of lube-oil analysis is taking the sample. Test results can be no better than the sample taken. A true sample must properly represent the flow of oil being furnished the engine or turbine. In Fig. 1, two typical large-horsepower-engine lubrication systems are shown.

One system uses full-flow filtration; the other uses bypass-type filtration. The point of sampling is on the oil-

LUBRICATING OIL RESULT SHEET

DATE: _____

SUBJECT: RESULTS OF LUBE OIL TESTS ON SAMPLES TAKEN AT _____

Date Sampled:
Date Received at Lab:
Date Tests Completed:

	TEST RESULTS				
Field Sample Number	1	2	3	4	
Source	#1 Engine	#2 Engine	#2 Turbine	#3 Turbine	
Laboratory Number	L-4108	L-4109	L-4110	L-4111	
Type Oil	M-4D	M-4D	T-MH	T-MH	
Insoluble in Chloroform	0.08		0.02		
Insoluble in Pet. Ether	0.12		0.05		
Ash, % by Wt.	0.50		0.00		
Water, % by Wt.	1.2	Nil	0.2	Nil	
Viscosity at 210° F., SSU	87.5	82.0	55.4		
Neutralization Number	1.5	Less 0.8	0.4	0.1	
Rust					
S. E. Number					

LUBRICATING-OIL RESULT SHEET. All of these tests are standard ASTM or Federal Stock Catalog designated tests. Fig. 3.

return line to the engine. Everything that has been done to the oil, including possible contamination from an outside source, will be reflected in a sample of oil taken here.

The plot shown in Fig. 7 represents a prime example of bad lube-oil sampling. After 33,000 hours of operation, the analysis showed a marked increase in viscosity indicating something wrong with the engine. A second sample of oil was taken and the engine thoroughly checked over. No troubles were found and the analysis of the check sample showed the oil to be in good condition.

Certain pertinent data are also taken at the time of sampling. A sample data sheet is shown in Fig. 2. This data sheet accompanies the oil sample to the laboratory and is used later to help interpret test results.

Oil samples are taken from all of Mobil's large-horsepower engines and steam turbines every 4 months. The schedule is staggered so that a given number of samples reach the laboratory for analysis each month.

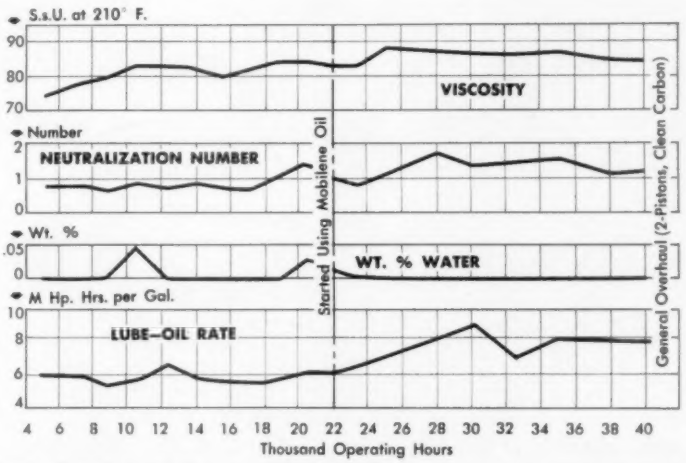
Tests. A lubricating-oil result sheet is shown in Fig. 3. All of these tests are standard ASTM or Federal Stock Catalog designated tests.

The tests on viscosity, water per cent by weight, and neutralization number have been found to be the best indicators for engine-crankcase oils. When something is wrong with an engine these test values change quicker and at a greater rate than any of the other values tested. Normally, these three tests are all that are run on samples of engine-crankcase oils and make up what is called a standard test. Such a test is shown under Field Sample No. 2 in Fig. 3 on this page.

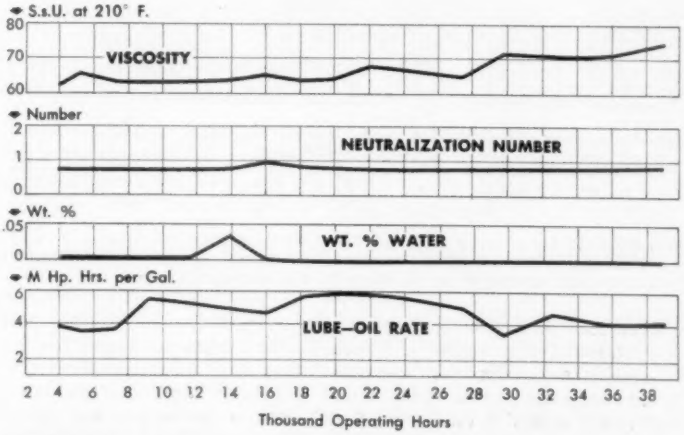
Should any of the results of the standard test exceed approved limits, a more complete test is run to provide more information for evaluating the oil and determining the cause of its failure. This complete test is shown in Field Sample No. 1

The most useful tests on turbine oils are water per cent by weight and neutralization number. These two comprise the standard test which is shown in Field Sample No. 4. The complete test is shown under Field Sample No. 3.

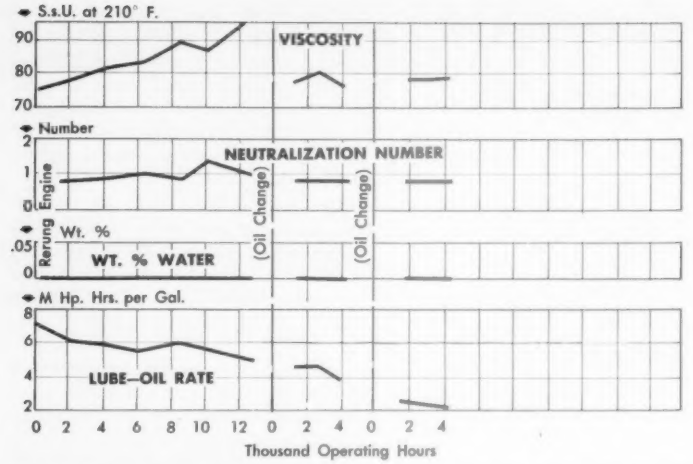
Considerable savings are possible by running only the shortened tests. The intracompany laboratory charges are: $41 for a complete test, $15 for a standard test on engine crankcase oil, and $10 for a standard test on turbine oil. In most cases these or other lube-oil tests are furnished as a free service by the lube-oil supplier to his customers.



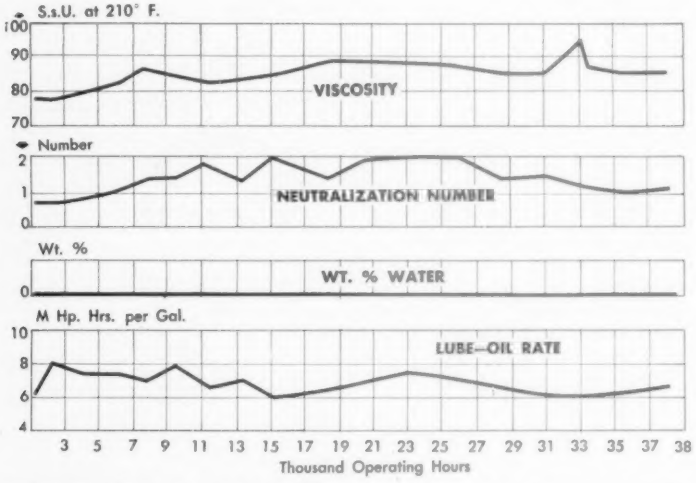
TEST VALUES for a two-cycle gas engine with almost 5 years' service without any major repairs. Twice during this period the oil was found to contain water. Fig. 4.



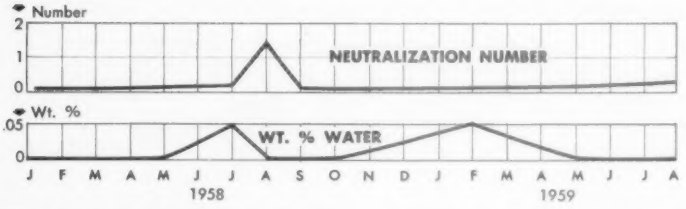
TEST RESULTS for a four-cycle gas engine operating 5 years without major repairs. Note gradual increase in viscosity and oil consumption after 30,000 hours of operation. Fig. 5.



RESULTS FROM ENGINE after overhaul. Viscosity of oil increased rapidly indicating oxidation and contamination. Oil consumption also increased rapidly. Trouble was traced to a set of piston rings that never did seal. Fig. 6.



PRIME EXAMPLE of bad lube-oil sampling. After 33,000 hours of operation, the analysis showed a marked increase in viscosity indicating something wrong. A second sample of oil was taken and engine thoroughly checked. No troubles were found and check sample showed oil to be in good condition. Fig. 7.



TEST RESULTS for a large steam turbine. First increase in water and resulting increase in neutralization number was traced to a malfunctioning oil reclaimer and second show of water to a ruptured steam seal. Fig. 8.

Recording test results. Normally, only standard test values are used. To make the plotting more meaningful all results are plotted against thousand hours' operation on the oil. Also added for engines is a plot of the lube-oil consumption since oil makeup has a direct relation to test results.

Fig. 5 is a plot of test results for a four-cycle gas engine that has been operating approximately 5 years with no major repairs. Note the gradual increase in viscosity and oil consumption after 30,000 hours of operation. This is probably caused by wear of the piston rings and could be substantiated by running compression tests, checking for blowby, etc.

Fig. 6 shows the results from an engine after an overhaul. The viscosity of the oil increased very rapidly indicating oxidation and contamination. Oil consumption also increased very rapidly. The trouble in this case was traced to a set of piston rings that never did seal.

Water, per cent by weight. Fig. 4 is a plot of test values for a two-cycle gas engine with almost 5 years' service without any major repairs. Two times in this period tests showed the oil to contain water. This was found to be caused by low lube-oil temperature attributed to a faulty temperature control on the engine jacket water. Had the water remained in the oil considerable damage could have been done.

The water content shown in Fig. 5 was eliminated by raising the engine-jacket-water temperature and adding extra crankcase breathers.

Test results for a large steam turbine are shown in Fig. 8. The first increase in water and the resulting increase in neutralization number was traced to a malfunctioning oil reclaimer. The second show of water was caused by a ruptured steam seal.

Neutralization number. An oil may test acidic when new thereby making the absolute values of this test of little importance; however, when the neutralization number of the original oil is compared with that of the used oil the test has some significance. In using this test we interpret an increasing number to indicate that there is excess oxidation going on in the oil and the cause of this should be found and eliminated.

Program results. Previous to the lube-oil-analysis program our maintenance people were faced with the problem of when to change oil in certain units. They were not willing to take a chance with costly equipment, and changed the oil just to be safe. Now they are no longer faced with this problem. If oil in an engine or turbine is questionable they simply have a sample analyzed. Then they know whether they should change the oil or not. Considering the fact that many engine lubricating systems hold $350 worth of oil and some even more, the economics of this is easily seen.

The real value of this program though has been the aid it has given to our people in their preventive-maintenance program.

Interpretation of Lube-Oil Results

Viscosity test — (ASTM Designation D-88-56)

This is a measure of the resistance of the oil to flow due to internal friction. This is probably the most important single property of the oil. The viscosity of the oil should be kept within the limits recommended by the manufacturer.

An increase in viscosity is usually caused by oxidation of the oil or by contamination of the oil by the products of combustion.

Possible causes:

1. Engine oil temperature too high.
2. Engine-jacket-water temperature too high.
3. Blowby from stuck or worn rings.
4. Fuel mixture too rich, causing excessive firing temperatures.

A decrease in viscosity is a rare occurrence in natural-gas-fueled engines, but would indicate dilution.

Water test, per cent by weight—(ASTM Designation D-95-56T)

This is an actual measure of the water contamination of the oil. Water content of the oil should always be nil. Water increases the viscosity of the oil and if allowed to stay in the oil, will cause sludge formations. Any water content in the oil calls for immediate investigation.

Two possible sources of water are:

1. Products of combustion.
2. Water leaks.

Possible causes:

1. Low jacket-water temperatures, allowing condensation of water on cylinder walls.
2. Low lube-oil temperature, allowing water to condense in the oil.
3. Excessive blowby past piston rings.
4. Bad crankcase ventilation.
5. Water leaks in oil coolers or engine water jackets or both.
6. Steam seal leakage on steam turbines.
7. Malfunctioning oil reclaimer on steam turbine.

Neutralization number test—(ASTM Designation D-974-55T)

This test is a measure of the acidity of the oil. A high test value may indicate corrosion ability of the oil. However, this should be only relied upon to indicate oxidation or contamination of the oil is taking place. Fuller's earth filters can be used on mineral oils to control neutralization number.

Possible causes:

1. Engine-oil temperature too high.
2. Engine-water temperature too high.
3. Blowby from stuck or worn rings.
4. Fuel mixture too rich, causing excessive firing temperature.

Ash test, per cent by weight—(ASTM Designation D-482-46)

This test is an indication of contamination with dust, dirt, etc. of straight mineral oils only. Results of the test may be too complicated to indicate detergent loss or contamination. However, it may give an indication of engine wear.

Possible causes:

1. Dirty or ineffective air filter.
2. Ineffective oil filtration.
3. Excessive wear of engine parts.

Insolubility test, per cent insoluble in petroleum ether. (Fed. Stock Cat. No. 311.1.1)

This is a measure of the total insolubles such as dust, dirt, gums, tars, etc.

Possible causes:

1. Dirty or ineffective air filter.
2. Ineffective oil filtration.
3. Excessive wear of engine parts.
4. Engine condition bad in general (see causes listed in other tests).

Insolubility test, per cent insoluble in chloroform. (Fed. Stock Cat. No. 311.1.1)

This is a measure of the insolubles that are contaminates. This test is run on the insolubles found in petroleum ether.

Possible causes:

1. Dirty of ineffective air filter.
2. Ineffective oil filtration.
3. Excessive wear of engine parts.

Insolubility difference test.

The difference between the values of the insolubles in petroleum ether and in chloroform is a measure of the resins formed in the oil by oxidation or thermal cracking or both.

A new high-speed magnetic-tape drive is claimed to greatly increase the life expectancy of magnetic tapes used with electronic data-processing systems. The new machine uses an all-vacuum drive (clutch) as well as vacuum to hold the tape reel on its hub and the tape on the reel.

Some advantages:

Can read or record as many as 96,000 numerals or 64,000 alphanumeric characters per second.

Has a rewind speed of 360 in. per second.

After receipt of a command it will be traveling at full speed in 2.7 milliseconds. On deceleration it moves less than 0.3 in. before coming to a stop.

Only the mass of the tape requires acceleration, thus minimizing the force transmitted to and by the tape.

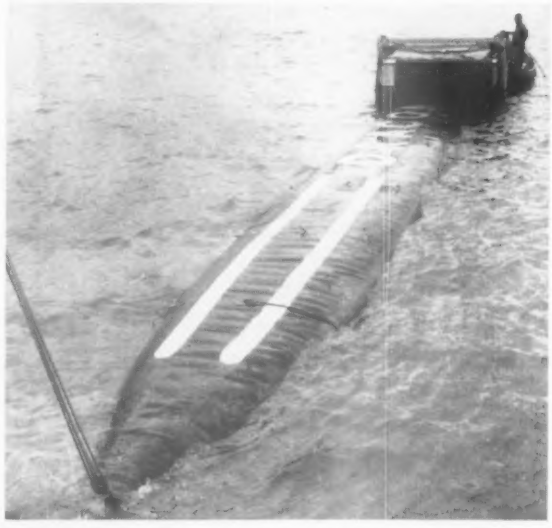
Tape-accelerating forces applied by vacuum drive are distributed over an area averaging 15 times greater than in mechanical systems.

Manufactured by Datamatic Division of Minneapolis-Honeywell Regulator Co., the unit is 5 ft. 9 in. high and occupies a floor area slightly over 2 sq. ft.

THE DRAGON can be towed with a nylon rope or simply lashed to the side of the towing vessel. Cleaning is done with a broom.

This "dragon" hauls oil products

Huge sausage-shaped tank holds over 10,000 gal. and can take a lot of punishment. Filling from collapsed state takes 15 minutes



WHEN NOT IN USE Dracone can be rolled up and stored on a reel.

BY M. SWISS
London Correspondent

Floating fuel tanks that look like sausages are finding a lot of applications these days. They are hauling diesel fuel to a gold-dredging operation in a remote Bolivian jungle; moving kerosine along the Niger Delta for Shell-BP Development Co. Ltd.; transporting avgas for Esso Standard Oil Co. in England; and they have helped Imperial Chemical Industries, Ltd., move hydrocarbons across the North Sea to Holland.

The big sausage is a neoprene-coated nylon tank, named "Dracone" by its developers. Dracone is the Greek word for dragon. Capacities of the various tanks are shown in the accompanying chart.

The vessel is tapered at both ends and a rigid cone in one end enables it to hold up under the battering of heavy seas. A stabilizer is fixed astern and a hose is attached for loading and unloading. The inside can be made of various materials, depending on the service. Acrylonitrile is used for solvents.

From the collapsed state it takes about 15 minutes to fill the 10,200-gal. tank by gravity. Rate of unloading of course depends on the capacity of the pump. When not in service it can be rolled up on a reel or filled with water or carbon dioxide.

Working life for one of these tanks is estimated to be about 5 years. Operational tests show that it will take a lot of rough treatment. Its skin is flexible and its ability to wrinkle will keep it intact even when colliding with rocks or jetties. And incomplete filling down to 60% of capacity has no adverse effect on its performance. The makers claim it has excellent resistance to abrasion.

Types of Dracones Available

Type	B	D	F	K
Cacapity, tons at sp.gr.=0.8	15	35	100	320
Capacity, gal.	5,400	10,200	33,600	108,000
length, ft.	70	100	140	200
diameter, ft.	4	4¾	6¾	10 1/6
weight, empty, lb.	1,000	2,300	4,000	12,000
reel width, ft.	7	9	12	17½
reel diameter, ft.	5½	6½	7	8

Cleaning is no problem. All it needs is water and a broom.

The idea for the sausage was hatched in 1956 when the British were having so much trouble in Suez. Shipping was short and the obvious solution was to have tankers tow an extra vessel in order to get the maximum use of power from the available ships.

First tests on the Dracone were made in a bath tub. Later models were tested in England.

So far the Dracone has been tested with liquid hydrocarbons from diesel fuel to aviation gasoline and solvents in almost all weather and climates. And it appears to give good results.

Dracones were developed and are sold by Dracone Operations, Ltd., although several other firms are licensed to manufacture and sell them. The company prefers to operate them on a contract basis and then offer them for sale to users after a year of operation. A 10,200-gal. tank costs about $25,000.

How costs will be cut in tomorrow's refineries

THE OIL INDUSTRY can contribute as importantly to the nation's economy in the future as it has in the past by continuing to pay high wages and keeping the prices of its products down.

Product prices can be kept down by reducing processing costs. Longer onstream times, packaged components for rapid plug-in, and automation are the means for future cost cutting.

The present . . . For a long time now the ready answer to lower costs has been "Build it bigger." In the last 35 years, the size of cracking units, for example, has increased from 600 bbl. per day to 100,000 bbl. per day.

Large-capacity units have lowered unit costs of construction and operation tremendously. Tankers and pipelines have also joined in. Although further gains can be made, this door now seems to be closing.

Another way to lower unit-costs has been to remove plant bottlenecks. Many units built in the last 20 years have had enough "rubber" to be stretched, at minor expense, to 20, 50 or even 100% over original design rates. Perhaps the bottlenecks were from too-optimistic marketing prospects as well as the lack of basic chemical and engineering data.

Now, plants are less stretchable, because of the need for minimum initial costs and the availability of more basic data.

The future . . . Consistent onstream times of 93 to 97% are considered routine. Down time of 3 to 7% is accepted. Now, with maintenance costs so high and profit margins so close, it sometimes takes 6 months to pay for turnarounds.

In the future, refinery units should stay onstream for 4 to 5 years. To do this, better materials of construction and ways to eliminate wear, corrosion, and fouling must be found. As a start, keep crude out of contact with air. Then follow with pretreatment to remove fouling compounds, and finally, control operating conditions more precisely by automation.

As well as stretching the time between turnarounds, their duration should be cut. Times can be cut with packaged equipment complete with pumps, piping, and instruments ready for rapid plug-in to units. With such equipment, whole sections can be pulled out and quickly replaced.

After the plant is back on stream, the unused sections can be repaired. We ourselves, for 5 years, have prepared standard units of condensers which are interchangeable and which we use in the way I have described to reduce down time.

Assembly-line production of packaged equipment will cost less than field-constructed items. If costs are low enough, smaller refining units nearer markets could be afforded. Product transportation costs would then be lowered.

As wage costs continue to rise, packaged assemblies will show an increasing advantage in both construction and maintenance.

Plant layout is still governed by considerations that are no longer pertinent. When failures were frequent it was good business to spread the units apart. Today their incidence is a minute fraction of the industry's experience a few decades ago.

Bringing the units back together will help reduce costs of foundations, piping, instrumentation, and the distances to be traveled by the more limited force of operators.

Automation holds promise of startups and shutdowns with less trial and error than can be achieved through hand control. Then, with the automatic fire-protection equipment now available, plus automation and packaged equipment, plants can be built more compactly and be safer and less costly.

Without question, automation offers the best way to further lower operating costs. It can control with more precision and contribute to longer runs, higher rates, faster shutdowns and startups, and lower utility costs.

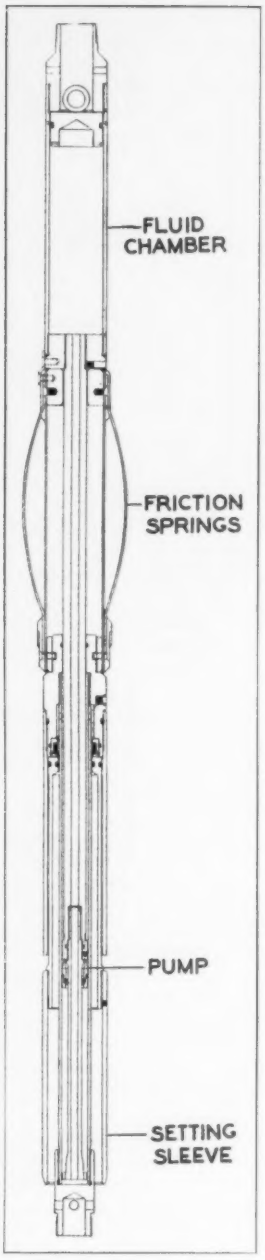
It can improve product quality and at the same time stop the waste of off-specification materials. Automating older plants will extend their economic lives.

Broadly viewed, automation is more than a means to reduce costs. It is a vital technological necessity. New, complex, and interdependent processes are feasible with automation. The human mind is not capable of absorbing all the needed data from these processes and issuing decisions fast enough.

Although we have come a long way in instrumentation and automation, we still have much to learn. For example, new ways to transmit information are needed. This can save costs and prevent down times when instrument air tubing and electric wires are damaged.

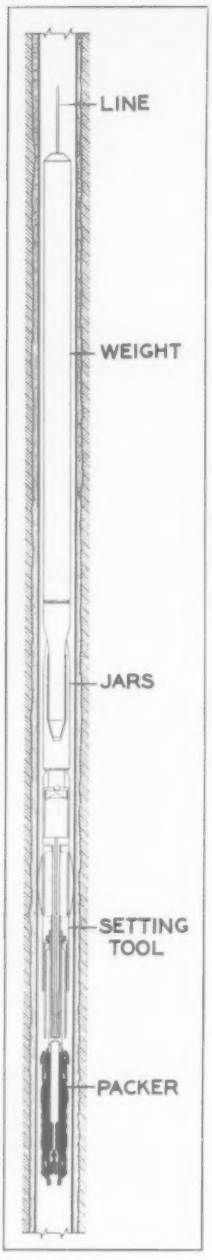
In the future, computers may perhaps control processes through wireless and pipeless channels. Or devices mounted directly on the unit combine in one housing the functions of sensing, computing, and controlling.

Adapted from a speech delivered by Clarence H. Thayer, manufacturing vice president, Sun Oil Co., at the annual meeting ASME, Atlantic City, N. J., December 1959.



♦ **RECIPROCATING** wireline setting tool can be operated with a low-strength mechanical wire line. It can set drillable production packers, squeeze packers, and bridge plugs. Fig. 1.

♦ **PACKER-SETTING** equipment. Bridge plug, squeeze, or production packer is attached to the bottom of the setting-tool assembly. Fig. 2.



Mechanical setting tool cuts cost of packers

Article is from a paper titled, "Reciprocating Wire Line Packer Setting Tool," presented at 1959 ASME Petroleum Mechanical Conference, Houston.

BY FRANK SHARP AND A. E. CUMMINS
Halliburton Oil Well Cementing Co.

THERE IS NOW on the market a new tool which promises to cut the cost of setting packers in oil and gas wells.

The tool is mechanical; it is operated by reciprocation up and down on the wire line on which the packer is run. The reciprocating setting tool is just as efficient as other setting tools and it is more economical. It may be used to set bridge plugs, squeeze packers, or production packers. The new tool has these advantages:

1. It can be used in wells with or without fluid. The hydraulic fluid necessary to operate the tool is carried inside the tool.
2. The tool eliminates a special setup for electrical wire line.
3. Either the sand line or the swab line on the rig can be used to operate the tool.
4. Less time is required with the tool than if the tubing were used to set the packer.
5. The tool can be placed accurately by "tagging bottom," "flagging the line," or using a depthometer on the running-in line. Collars can be located if it is run on an electrical line.

A combination weight indicator and measuring device is now under development. Such a device will make it possible to get more accurate measurement with a sand line.

Packer function. Setting bridge plugs and permanent drillable packers has long been standard procedure in well completions and workover. These packers and plugs are for such purposes as: (1) isolating zones for producing, squeezing, or treating, and (2) temporary or permanent plugging of a zone.

These packers include, basically, a packer element for sealing and two sets of slips for anchoring against movement in either direction. The setting mechanism is ordinarily embodied in a separate device, or setting tool, which is removed from the well after setting the packer. This arrangement cuts down on the amount of material to be drilled when the packer is to be removed.

Purpose of the setting tool is to force the two sets of opposing slips toward each other, compressing the packer element and causing it to seal inside the casing. The slips then hold the packer element in the set position. Permanent drillable bridge plugs and packers can be set in casing by any one of several methods. Selection of the method usually depends upon the factors discussed below.

Well conditions. Depth at which a packer is to be set governs length of time required. At shallow depths the short time required may not be im-

BETHLEHEM ROTARY LINE Cuts Drilling Costs in West Texas

Here's a view of the Sharp Drilling Company's Tornado Rig No. 40, drilling the University F3 for Jake L. Hamon Oil Company, in the South Andrews Devonian Field near Andrews, Texas. At the time of the photograph, the Bethlehem wire rope —1¼ in. 6 x 19 Formset Purple Strand, right lay, with IWRC— was operating in its third well. The Bethlehem rope had already logged thousands of ton-miles and was still going strong. The drilled depth of the well was then 10,667 ft, and the final depth was set at 11,151 ft.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

Export Distributor:
Bethlehem Steel Export Corporation

MILL DEPOTS AND DISTRIBUTORS FROM COAST TO COAST STOCK BETHLEHEM WIRE ROPE

BETHLEHEM WIRE ROPE
BETHLEHEM STEEL

BETHLEHEM STEEL

portant. But in deeper wells where running-in time is longer, consideration should be given to the method with the fastest running-in speed.

Some setting devices are affected by extreme pressure and temperature conditions. Mechanically actuated setting devices are generally unaffected by these factors.

Mud weight and condition of mud also affect running-in speed. Sometimes it is difficult to run enough weight with wire-line tools to get the packer down in a reasonable time through extremely heavy viscous mud. In such cases it may be necessary to run the packer on tubing.

Deviation of the well bore and obstructions in the casing may make it desirable to select a particular method of setting.

Associated work. The work which is to be done after the packer is set often plays an important role in selection of the setting method. If a plug is to be run and the casing perforated, it may be more economical to set the plug on an electrical wire line provided other conditions are favorable. Perhaps the well is to be squeeze-cemented, produced, or otherwise treated in an operation which utilizes the running-in string and the setting device. Then it may prove to be economical to run the packer on tubing.

Packer adaptability. If a packer is designed to be set with one type of setting device, results are probably best using this method. The success record of proper setting with different setting tools and packers should be considered in selecting a setting device.

There are several setting tools for use on both wire line and tubing. Most common tubing-type setting tool is a mechanical one which has friction members such as drag springs or drag blocks. These permit rotation or other manipulation of the tubing.

Tubing pressure is used in hydraulic tools to actuate a piston which transmits force to the packer.

Most common wire-line-type setting tool uses gas released by a burning propellant as a source of power for setting the packer.

Another wire-line type uses the hydrostatic head as a source of power. After a valve is opened either electrically or mechanically, well fluid enters the setting tool and the fluid pressure sets the packer.

Each of these methods has advantages along with some disadvantages.

Wire-line tool. The "reciprocating wire-line setting tool," Fig. 1, can be operated with a low-strength mechanical wire line. It can set drillable production packers, squeeze packers, and bridge plugs. Moreover, the setting tool is affected by neither temperature nor pressure. It can be retrieved with the packer if, for some reason, it is desirable to do so after the packer and setting tool have been run into the well. The setting tool can be used to set packers in dry or fluid-filled wells.

The reciprocating tool contains a hydraulic jack, consisting of two pistons and cylinders, one small and one large. These components are operated by the wire line that is used to run the setting tool, plug, or packer into the well.

There is a back-pressure valve for pressure buildup located above the setting sleeve. Thus, hydraulic pressure applied to the setting sleeve by the pump cannot be released until the packer is set.

A set of drag springs is attached to the outside of the tool. These help prevent the plug or packer from moving down the hole during the pumping operation before the top slips are set.

The setting tool requires a wire line or cable with a minimum of 3,000-lb. tensile strength plus line weight to set a packer requiring 30,000-lb. setting force. Normally any sand line or swab line is adequate.

The bridge plug, squeeze, or production packer is attached to the bottom of the setting-tool assembly as shown in Fig. 2. Three to five hundred pounds is necessary to push the drag springs and packer into casing. This much weight must be added on top of the setting tool. The weight used may be a link jar, sinker bar, or the like.

Safety feature. The hydraulic pump in the tool is operated by taking a 20-in. upward stroke with the line. Six full pump strokes are required before any force is applied to start setting top slips. This provides a safety factor for accidental pump strokes while running into the well.

Continued pumping shears the pins, sets the bottom slips, and expands packer rubbers.

Pressure is built up by the pump by means of a small piston moving fluid into a larger cylinder. As this action continues, fluid acting on the piston in the larger chamber develops a greater force on the tension sleeve or pin. This force is 12 times the pull taken on the wire line.

When sufficient pressure has been built up in the setting sleeve chamber, tension sleeve or pin parts; then the setting tool is free for removal from well. Fifteen to eighteen full strokes set the packer and part the tension sleeve or pin. Additional strokes cause no damage to the setting tool or packer.

Tandem trailer stays around to serve as a handy base of operation when hooking up tank batteries. Instead of dumping pipe on the ground to be buried under mud, weeds, and scattered around the area, Superior Oil Co. drivers simply drop the trailer at the lease site. This prevents the pipe ends plugging and threads clogging. When the job is finished the truck tows the trailer back to the yard. The one pictured is in use in Fulton Beach field, Aransas County, Texas.

New knock-test method could save millions in finding octane numbers

- Fresh approach to more precision in obtaining octane numbers of motor fuels is based on theory that the time at which detonation occurs in the combustion cycle is the factor that determines the intensity of that detonation.

BY G. A. MacDONALD
Research Department,
Socony Mobil Oil Co.
Brooklyn

A CHANGE in the standard knock-rating method promises to improve precision by a factor of two or more. This procedure is being tried with the research method but in principle it could also be applied to the motor, aviation, and possibly the supercharge methods.

In the new procedure the time between ignition and the occurrence of knock is measured and held constant. The same octane level can be obtained as before but with greater ease and certainty. Research Division I, on Combustion Characteristics of ASTM Committee D-2 on Petroleum Products and Lubricants, is currently studying the application of this procedure to a wide range of gasoline blends.

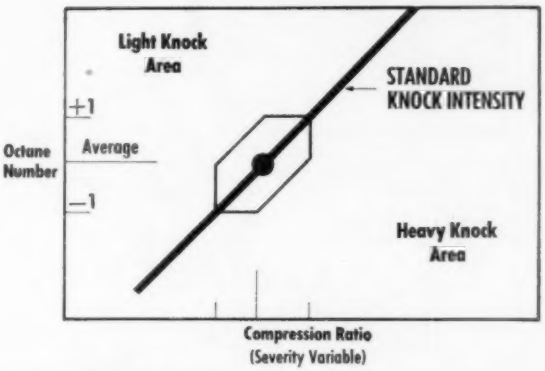
Long-time problem . . . The oil industry has long been faced with a problem in connection with obtaining precise octane numbers of motor gasolines. Octane numbers are determined on an even-increment, arbitrary scale indicating the relative tendency to detonate, or "knock" in the combustion process. The problem is actually twofold, dealing with (1) the correlation of laboratory-determined octane-number ratings to road performance and (2) the unsatisfactory precision of current standard test methods for determining octane number.

Poor precision of ratings can be tremendously expensive to the gasoline producer and can be the cause of poor performance for, and widespread dissatisfaction by, the consumer.

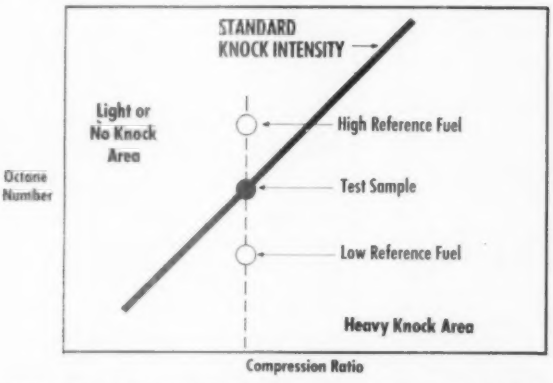
The second of these problems when solved may also contribute substantially toward solving the correlation problem. It has been estimated that poor precision of current test methods costs a minimum of 10 million dollars per year in the production of gasoline[1].

Since this estimate was made in 1952, octane-number levels have risen sharply and the problem has become more acute. Above 100-octane number, a level which is now reached by commercial motor gasolines, test precision deteriorates rapidly.

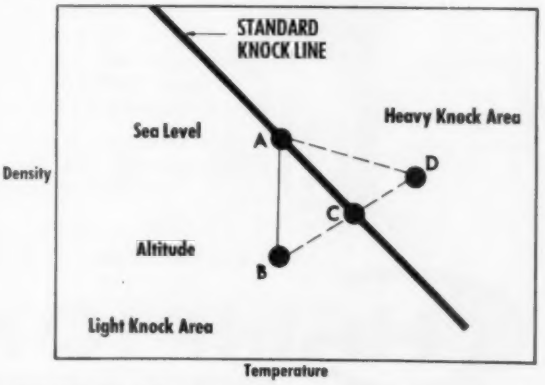
Most of the effort directed toward solving the precision problem has centered in Research Division I on Combustion Characteristics, a subcommit-



RESEARCH TEST RATINGS are obtained within a general testing area, rather than a specific point, due to limitations in instrumentation and impossibility of getting exactly reproducible results. Fig. 2.



RESEARCH OCTANE METHOD uses reference-fuel blends which bracket the test sample. Octane number of test sample is determined by interpolation of knock-meter readings. Fig. 1.



ALTITUDE ENGINE operates with relatively lower density and higher temperature of the end gas at detonation. Fig. 3.

tee of ASTM Committee D-2 on Petroleum Products. In the past few years this division has studied new cylinders and new instrumentation for the knock-test engine, more accurate equipment for blending reference fuels, variations in guide-curve settings of octane number vs. compression ratio, spark plugs, piston rings, and other equipment.

It has worked to provide and distribute information on the improved apparatus, test techniques, and maintenance practices resulting from these studies. Despite all this effort it was apparent at an ASTM symposium held in October 1958 that refinements of this nature were not giving the needed improvement in precision. A new approach to the problem was required.

Present method . . . A brief explanation of the basic points and weaknesses of the present research method[2] may help to explain why further refinements have not improved precision appreciably. This explanation will also serve as a foundation on which to build a subsequent explanation of new test procedure. Similar reasoning would apply to the motor method[2].

The present test is based on setting a variable - compression - ratio test engine to fixed conditions, carefully specified and controlled, so as to obtain "standard" knock intensity on the test sample to be rated. At these conditions the knocking intensity of the test sample is noted on a knock meter. Reference-fuel blends of known octane number are then run under exactly the same conditions and their knocking intensities noted on the meter.

These reference-fuel blends are selected to bracket the test sample, whose octane-number value is then determined by interpolation of knock-meter readings. Fig. 1 illustrates the procedure.

This procedure, essentially unchanged, has stood the test of time and served the oil industry for over 25 years.

During this period, however, gasoline quality has improved tremendously. To achieve this higher quality it has been necessary to change fuel composition. This combination of higher octane number and different fuel composition has created a situation where test equipment is being used close to the upper limit of its efficient operating range.

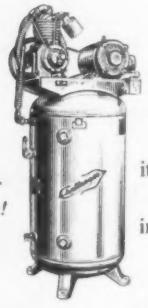
This usage highlights the basic weaknesses of the test method. Variables which were unimportant, having little or no effect on ratings of straightrun gasoline made at 5 or 6 to 1 compression ratio, become significant when rating highly cracked gasoline at 9, 10, even 11 to 1 compression ratio.

Two faults . . . There are two basic faults in the current standard method. These are (1) instrumentation, which does not determine standard knock accurately, and (2) the impossibility of setting test-engine conditions so that test severity is exactly reproducible between two different engines or, in fact, on the same engine at different times.

The result is that test ratings are obtained within a general testing area, rather than at a specific point. The size of this area varies among laboratories. It is limited by relative ability to set test conditions for standard knock and by relative severity of the test engine.

Severity is a variable which can be controlled only within reasonable limits. For example, it is manifestly impossible to manufacture all test-engine components within the close tolerances required to produce units having exactly equal severity. It is even more impossible to control field use of such equipment, with variables such as carbon deposits, leaky valves, valve clearances, spark settings, etc., affecting compression-ratio settings.

The result is that ratings are obtained within the general area mentioned, with test results varying in



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the order of ±1 octane number. This is shown in Fig. 2.

Pressure effects . . . One of the important variables affecting test results is barometric pressure. Even small changes in pressure affect ratings and, until recently, differences between sea-level and altitude laboratories amounted to as much as 1.5 to 2.0 octane numbers. In 1955 revisions were made to the test method which eliminated, or reduced greatly, the effect of barometric pressure on ratings.

These revisions were based on cooperative work done in the altitude chamber at the Bureau of Standards in Washington, D. C. The work was prompted by presentation of "the time, temperature, density theory"[8] to the industry in September 1952.

The time, temperature, density theory teaches that detonation occurs only when a critical combination of temperature and density is reached in the unburned end gas in the combustion chamber. Since inlet-air pressure is lower at altitude, end-gas density tends to be lower.

At standard knock, therefore, the altitude engine operates with relatively lower density and higher temperature of the end gas at detonation. Higher temperature depreciates—is more severe on—normal gasolines relative to reference fuels so that lower ratings result at altitude.

In order to correct this situation it is necessary to do two things: (1) increase compression ratio to raise density and (2) decrease inlet-air temperature to lower end-gas temperature. A table is now given with the method which lists inlet-air temperatures and micrometer corrections to be used at various barometric pressures.

This explanation may be visualized in Fig. 3.

Point A represents the temperature and density in a sea-level engine. At the same compression ratio, the altitude engine would not knock at point B. If the altitude engine is adjusted to standard knock it will be at point C since density will increase some but so will temperature. To return to point A requires further increase in compression ratio (to point D) and lowering of inlet-air temperature back to standard knock intensity.

New theory . . . Unfortunately, however, this does not solve the basic problem of poor test precision at all altitudes, even though it results in improved operation at altitude laboratories, which can now produce test results at the same octane-number levels as do sea-level laboratories. The theory on which the improvement in the altitude-rating problem was achieved, however, led directly to the theory on which the new detonation time-lag procedure is based.

This theory hold that the **time** at which detonation occurs in the combustion cycle is the key factor which determines the intensity of that detonation. It holds, further, that detonation time delay increases in direct relation to knocking quality, or octane number, assuming test-engine conditions remain constant. Detonation, or knock, occurs when a temperature-density relationship conducive to knock has been built up in the end gas during the combustion process.

When a knock-conducive temperature-density relationship is reached early in the combustion cycle, a considerable amount of end gas remains and the resultant knock is heavy. When this condition occurs later in the cycle, normal combustion has progressed further, less end gas remains, and knock is lighter. This is shown in Fig. 4, with knock intensity, octane-number quality, and detonation time in direct relationship.

When engine conditions are adjusted so that a heavy knock is obtained on a 97-octane-number fuel, for example, detonation time can be measured as occurring at 2° after top dead center (A). As progressively better fuels of 98, 99, and 100-octane num-

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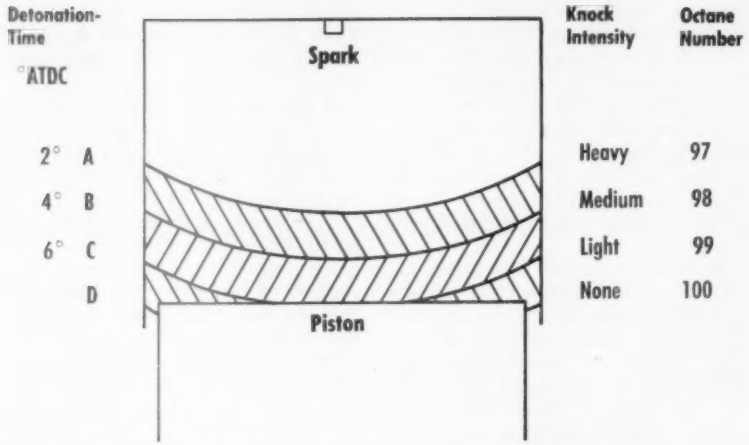


KNOCK IS HEAVY when knock-conducive temperature-density relationship is reached early in the combustion cycle. Later, when less end gas remains, knock is lighter. Fig. 4.

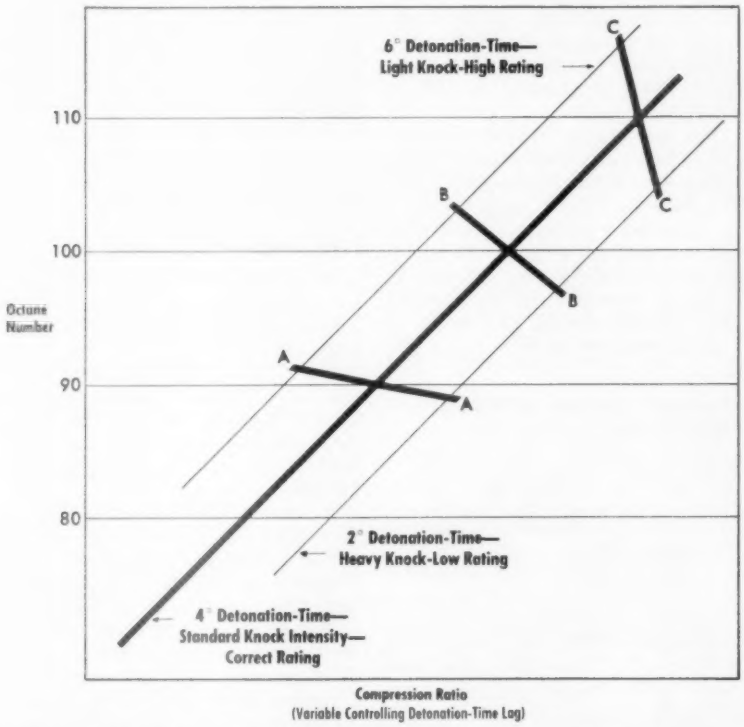
ber are substituted, knock intensity decreases to medium (B), light (C), and no knock (D), while detonation time increases in steps to the point where it can no longer be measured.

The same relationship of knock intensity and detonation time can be established using only one fuel and varying compression ratio to achieve different knock levels.

The importance of time measurement as a means to control and duplicate correct rating conditions is shown in Fig. 5. Reference fuels, having no zero sensitivity by definition, are denoted by horizontal lines showing the same octane number at any compression-ratio, or engine-severity, setting. At low-sensitivity, straightrun fuel, line A, is angled only slightly since extreme differences in engine severity do not change ratings on this type of fuel to any great extent.

A medium-sensitivity fuel, line B, is angled more sharply since its rating is affected more by severity changes. A highly aromatic, very sensitive, fuel is denoted by line C, at an extreme angle. For this type of fuel small changes in engine severity have a significant effect on ratings.

As Fig. 5 indicates, it is only at the correct condition of standard detonation time that standard knock intensity and correct rating are possible for all fuel types.



CORRECT CONDITION of standard detonation time is necessary to reach standard knock intensity and correct rating for all fuel types. A refers to insensitive fuel. Ratings are not greatly affected by engine severity. B refers to medium-sensitivity fuel, where ratings are moderately affected by engine severity. C refers to high-sensitivity fuel. Ratings are considerably affected by engine severity. Fig. 5.

Apparatus

The new test method does not require any major changes in the test engine used for the research method (ASTM D908). In the test work completed so far, a split-head cylinder has been used instead of the standard cylinder and a curved intake-air pipe has been used instead of the straight pipe with elbow.

The important changes are in instrumentation which, in this procedure, measures time of knock rather than intensity of knock. The ignition lag meter ECS-1, made by Solartron and described in the cetane method, ASTM D-613, has been modified to measure the time interval between the occurrence of knock and a fixed point in the combustion cycle.

The ECS-1 meter is an electronic switch which is turned on by a detonation pickup at the time of knock and turned off by a fixed flywheel reference pickup. The electric current through the switch during this period is integrated and appears on a steady reading meter which indicates the time interval in crank-angle degrees.

Procedure

The procedure is very similar to that of the present standard research method. It is based on setting the standard CFR variable-compression-ratio single-cylinder test engine to fixed conditions which will produce "standard" knock on the fuel to be tested. In this procedure, however, these conditions are determined by a fixed measurement of detonation time, in crankshaft degrees after top dead center. Since detonation time determines knock intensity, holding detonation time constant holds knock intensity constant.

Bracketing reference-fuel blends, of known value, are used in this procedure as they are by the present method. Compression ratio is adjusted to produce the same detonation time for these reference fuels as for the test sample. Compression-ratio difference required to hold detonation

time constant is the variable measured to determine comparative quality or octane number.

For convenience, such measurements are made normally in terms of cylinder-height micrometer readings rather than in actual compression ratio.

The chief advantage of the procedure is the improved precision attained. Preliminary work indicates that a standard deviation of about 0.10 research octane number can be obtained on current commercial gasolines. Since the critical factor, detonation time, can be measured by this procedure, test results can be produced and reproduced within close limits. In principle the procedure can be applied to any knock-test method.

Precision data . . . The precision studies on the detonation time-lag test show a marked improvement over current methods. In Table 1 the results show a standard deviation within a laboratory of 0.13 octane number. These tests were run on coded fuels, and with ratings on check-fuel AK-237 adjusted to 98.2 ± 0.10 by varying intake-air temperature. A similar degree of precision can be attained at other combinations of test conditions.

It is quite possible that future development work directed towards improved precision would show even better results. Tests on fuels of very wide ranges in composition have shown equally promising results for the test method. Fuels above 100-octane number show the same precision as those below 100. These statements are made on the basis of test results tabulated in Table 2.

For commercial fuels as a group at current octane levels, a standard deviation of about 0.10 research octane number is indicated.

All of these data were obtained with a single engine but with various operators and at various times. It is, therefore, intermediate between repeatability and reproducibility.

TABLE 1—PRECISION OF DETONATION LAG TEST FUELS AT ONE OCTANE LEVEL

Operator	Check fuel AK-237	Test fuels 1	2	3
1	98.1	98.1	97.8	97.5
	98.3	98.2	97.6	97.7
	98.2	98.2	98.0	97.8
2	98.2	98.2	97.8	97.6
	98.2	98.2	98.0	97.7
	98.1	98.0	97.8	97.5
3	98.3	97.7	97.7	97.6
	98.2	98.0	97.7	97.6
	98.2	98.0	97.7	97.6
Average		98.1	97.8	97.6
Range of 9 tests		0.5	0.4	0.3

Over-all standard deviation = 0.13

Cooperative program . . . In addition to the data, obtained by the Socony Mobil research laboratories while setting up this procedure, ASTM Committee D-2 (Research Division 1) has obtained some corroborative data during a recent program to investigate this new approach.

The cooperative ASTM program was carried out by laboratories representing nine different companies. Sixteen fuels were rated, under two sets of operating conditions. Since one fuel was used as a "base," or standard, in each case, a total of 30 series of ratings were available for analysis. These 30 were divided as follows:

- Eleven series of fuels below 100 octane number, ranging from 82.3 to 99.4. The over-all standard deviation for this group was 0.35 octane number.
- Twelve series ranged from 100 to 110 octane number with a composite standard deviation of 0.48.
- Seven series were over 110, ranging to a high of 119.0.

The standard deviation for this group was 0.58 octane number. A report on the data obtained in this program was presented to Research Division 1 at the Atlantic City meetings in June 1959.

These results are comparable to the present standard method for the fuels below 100. They are significantly better for the fuels from 100 to 110 and outstandingly better for the fuels above 110. Also, since this was the first time the participating laboratories had tried this procedure, it is expected that additional experience in installing and operating the new instrumentation will result in further improvement in precision.

TABLE 2—PRECISION STUDY OF FUELS AT VARIED OCTANE NUMBER LEVELS AND OF VARIED COMPOSITION

Fuels	Ratings 1	2	3	Range of 3 tests	Std. dev.
High Sensitivity					
Toluene (clear)	116.6	116.6	116.3	0.3	0.17
Ethylbenzene + 3.00 ml. TEL	112.1	112.2	111.7	0.5	0.27
Ethylbenzene (clear)	106.9	107.6	107.4	0.7	0.36
Low Sensivity					
Alkylate + 3.00 ml. TEL	104.4	104.4	104.4	0.0	0.000
Medium Sensivity Commercial Fuels					
1	101.8	102.0	101.9	0.2	0.10
2	100.4	100.3	100.2	0.2	0.10
3	99.9	99.8	99.8	0.1	0.07
4	94.0	94.0	93.8	0.2	0.12
5	91.7	91.6	91.6	0.1	0.07
6	90.5	90.3	90.3	0.2	0.12

References

1. Morrow, M. R., and Shewell, C. T., "Effect of Multitesting on Refinery Production Costs," API seventeenth midyear meeting, May 1952, San Francisco.
2. ASTM D908-56, ASTM D357-56, 1957 Supplement to ASTM Manuals of Engine Test Methods for Rating Fuels.
3. Siegel, B., "The Time, Temperature, Density Theory As Applied to Antiknock Rating Methods": Coordinating Research Council, CFR Motor Fuel Division meeting, September 1952, Detroit. ASTM Research Division I on Combustion Characteristics. October 1952, Chicago.

Refining company formed in France

A REFINING company has been set up by one of the two groups planning processing plants near Strasbourg, France.

Cie. Rhenane de Raffinage will operate a 60,000-bbl. plant owned by local affiliates of Socony Mobil, Caltex, and Shell-Berre, which is jointly held by Royal Dutch-Shell and St. Gobain.

Another 60,000-bbl. plant will be built by Pechelbronn-Antar and a British petroleum subsidiary, Cie. Francaise des Petroles, and its subsidiary, Cie. Francaise de Raffinage.

The plants will take feed from a 460-mile crude system from Marseille to Strasbourg and Karlsruhe, West Germany, where refineries are planned by the local Jersey Standard affiliate and by a group of German companies. The system will open in 1962 with an initial throughput of 160,000 bbl. daily of Middle East and North African crude.

18. How to obtain a K_g/K_o curve from laboratory steady-state relative-permeability measurements

BY E. T. GUERRERO
Head, Department of Petroleum Production Engineering, University of Tulsa,
and
F. M. STEWART
Petroleum Engineer, Continental Illinois National Bank & Trust Co., Chicago

GIVEN: The data in Columns 1, 2, and 3 of Table 1 were obtained on a core sample using the conventional laboratory steady-state relative-permeability test.

OTHER DATA: Minimum interstitial-water saturation, S_w, fraction of pore volume = 0.20.

FIND: Relationship between k_g/k_o and the total liquid saturation.

METHOD OF SOLUTION: The following equation applies:

$$k_g/k_o = \frac{k_g/k}{k_o/k} \qquad (1)$$

where:

k_g = effective permeability to gas.
k_o = effective permeability to oil.
k = absolute permeability.
k_g/k = relative permeability to gas.
k_o/k = relative permeability to oil.

SOLUTION: The data in Columns 1, 2, and 3 of Table 1 will be extended for the solution. Total liquid saturations are obtained by adding the minimum interstitial-water saturation value to each oil saturation, Column 4. Division of values in Column 3 by the respective values of Column 2 yields the k_g/k_o ratio, Column 5.

DISCUSSION: Relative permeability is defined as the ratio of the ability of a rock to transmit a fluid when partially saturated by that fluid (effective permeability) to its ability to transmit the same fluid when fully saturated by it (absolute permeability).[2] The ratio of a rock's relative permeability to one fluid to its relative permeability to another fluid at the same liquid saturation is the relative-permeability ratio for that saturation. Equation 1 shows this relationship. Note that this is also equivalent to the ratio of two effective permeabilities.

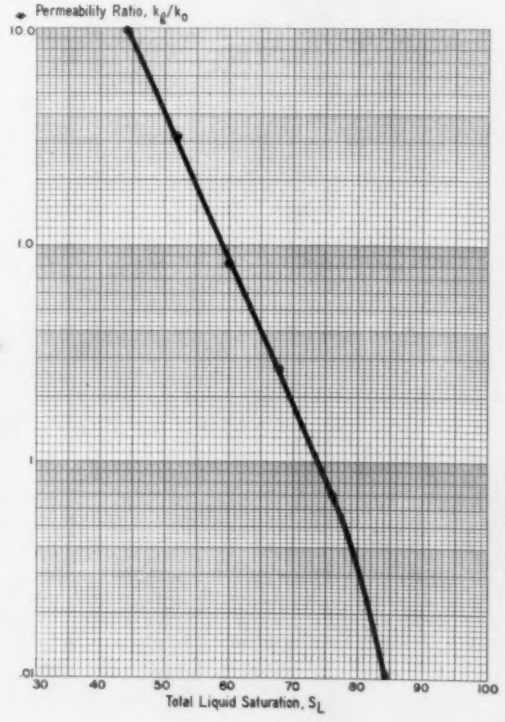
An example of the use of relative-permeability ratios is in the analytical determination of performance under primary and secondary-recovery conditions. Involved in this type of calculations are the instantaneous gas-oil ratio and fractional-flow equations which require knowledge of the permeability ratios in their solution.

There are essentially three methods for determining relative-permeability ratios: (1) steady-state, (2) unsteady-state, and (3) field data.[1] The first two are considered laboratory methods while the third requires knowledge of production tests. This problem is an example of the steady-state method. Subsequent problems will consider the other methods. In the steady-state method fixed ratios of the fluids of interest are flowed through the sample until equilibrium conditions of saturation and pressure gradient are established. In tests involving gas and oil the sample may contain minimum interstitial-water saturation. Each set of equilibrium conditions results in essentially uniform fluid saturations throughout the test sample and yields a permeability-ratio value.

The curve shows the results of this problem in a graph relating gas-oil relative-permeability ratio and total liquid saturation. This graph

TABLE 1—DATA AND RESULTS OF PERMEABILITY-RATIO PROBLEM

Run No.	1 Oil saturation S_o, % of pore vol.	2 Relative permeability To oil k_o/k	3 Relative permeability To gas k_g/k	4 Total liquid saturation S_L, % of pore vol.	5 Permeability ratio k_g/k_o
1	14.4	0	0.90	34.4	∞
2	24.0	0.06	0.60	44.0	10.00
3	32.0	0.10	0.32	52.0	3.20
4	40.0	0.22	0.18	60.0	0.82
5	48.0	0.37	0.10	68.0	0.27
6	56.0	0.55	0.04	76.0	0.07
7	64.0	0.76	0.01	84.0	0.01
8	72.0	0.88	0	92.0	0



VARIATION of relative permeability ratio (k_g/k_o) with total liquid saturation. Minimum interstitial water saturation = 0.20. Fig. 1.

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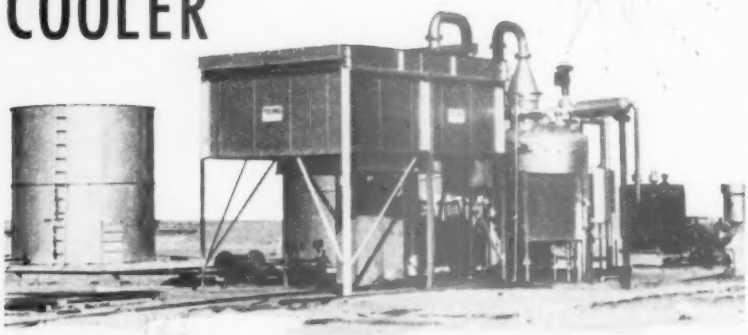

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is characteristically an S-curve becoming asymptotic at both high and low total liquid saturations. At high liquid saturations very little gas flows ($k_g=0$) and the ratio is very small. At low liquid saturations, the oil flow approaches zero and the permeability ratio becomes very large. In between these two extremes is found an almost linear relationship which occurs at total liquid saturations normally encountered in performance calculations.

The steady-state method of determining permeability ratios was the first developed and used. As noted, the calculations are very simple. But it normally requires several days or weeks to complete the measurements. As a consequence this method is not economically adaptable to routine core analysis. Furthermore, for a lease or pool, many cores must be tested to obtain sufficient data from which to develop a representative average relationship.

It should be emphasized that relative-permeability ratio not only depends on saturation and saturation distribution but also on pore-space geometry and configuration. For this reason it is expected that different rocks and different samples of the same geological zone would have different relative-permeability characteristics. Judgment is essential in the application of relative-permeability tests to actual problems in the same field. Use of such data in computations on fields or formations different from those represented by the samples is hazardous at best.

References

1. Owens, W. W., Parrish, D. R., and Lamoreaux, W. E., "A Comparison of Field k_g/k_o Characteristics and Laboratory k_g/k_o Test Results Measured by a New Simplified Method," Paper 518-G, Trans. AIME, 1956.
2. Calhoun, J. C., "Relative Permeability Ratio," The Oil and Gas Journal manual on Engineering Fundamentals, p. 23.

Line Serves Canadian Wells

DELIVERY of gas into the Westcoast Transmission Co., Ltd., system from British Columbia gas fields in the Jedney-Bubbles area has started, made possible by a new 25-mile extension of the Westcoast gathering system.

Initial daily deliveries of 12,000,000 cu. ft. are being increased to 50,000,000 cu. ft. Thirteen wells, including three dual-zone producers, are connected by the new lines laid by Marine Pipeline & Dredging, Ltd., of Vancouver. Five other wells are drilling or being completed.

Four companies owning the production include Pacific Petroleums, Ltd., operator; Imperial Oil Ltd., Sunray Oil Co., and Canadian Northern Oil & Gas Ltd.

BY W. L. NELSON
Technical Editor and Petroleum Consultant

Chemical consumption in refining

NO ONE can know the actual consumption of each chemical—the end uses of chemicals are obscure, duplication tends to occur, and petrochemical consumption tends to be confused with refinery consumption. However, over 7 billion pounds of chemicals costing over 590 million dollars were consumed during 1956. The tabulation on this page is an estimate based on capacities and consumptions, and on such sources as:

1. Anon. (PAD), Chemical Requirements of the Petroleum . . ., Chem. & Met. Eng., Jan. 1946, p. 139.

2. Danziger and Milliken, Molybdenum in Petroleum . . ., Pet. Engineer, Nov. 1956, p. C-3.

3. Jensen, J. T., Catalysts for the Petroleum Industry, Chem. & Eng. News, Aug. 20, 1956, p. 4090.

4. Larson, C. M., Additives for Fuels and Lubricants, Pet. Engineer, March 1955, p. C-44.

5. Shaw, D. T., Chemicals Used in Refining, Chem. & Eng. News, March 3, 1952, p. 862.

6. Weber, George, Petrochem Progress, The Oil and Gas Journal, Feb. 4, 1952, p. 40.

7. Whitaker, G. C., Inorganic Catalysts . . ., Ind. Eng. Chem., 49, 38A (June 1957).

	Millions pounds	Dollars per lb.	Thousands dollars
Acetone	3.5	0.08	280
Acetylene	1.6	....	....
Acid, acetic	....	0.10	....
Acids, fatty	....	....	....
Acid, hydrochloric	3.5	0.02	70
Acid, hydrofluoric	6.0	0.18	1,080
Acid, isobutyric	....	....	....
Acid, oleic	....	0.185	....
Acid, phosphoric	2.6	0.06	156
Acid, phenyl stearic	....	....	....
Acid, sulfuric (66° B.)	3,800.0	0.012	45,600
Acid, stearic	....	0.15	....
Additives and dyes, gaso.*	§108.0	0.24	26,000
Additives, lubes	410.0	0.29	118,000
Additives, middle dist.	14.0	0.40	5,600
Alcohol, ethyl	1.3	0.74	96
Alcohol, methyl	....	0.045	....
Alcohol, isopropyl	0.6	0.06	36
Alpha naphthol	....	1.00	....
Aluminum chloride	8.0	0.16	1,280
Aluminum oxide	....	0.04	....
Aluminum stearate	....	0.38	....
Aluminum sulfate	....	0.22	....
Ammonia, anhy.	9.8	0.18	1,760
Ammonia, aqua	....	....	....
Asbestos	....	....	....
Barium hydroxide	....	0.11	....
Bauxite	25.0	0.03	750
Benzene	5.0	0.045	225
Catalysts:			
Cracking, clay	200.0	0.08	16,000
Cracking, synthetic	350.0	0.17	59,500
Reforming, platina	7.2	†7.10	51,100
Reforming, molybdia	4.0	0.90	3,600
Reforming, chromia	2.0	0.70	1,400
Treating, cobalt-moly	0.8	1.10	880
Treating, others	2.0	0.70	1,400
Dehydrogenation, chromia	1.0	0.70	700
Calcium carbide	....	0.075	....
Calcium carbonate	....	0.02	....
Calcium chloride	10.2	0.03	306
Calcium hypochlorite	....	0.03	....
Calcium oxide and hydroxide	98.0	0.006	600
Calcium sulfate	....	0.022	....
Carbon dioxide	....	0.08	....
Carbon disulfide	....	0.07	....
Carbon tetrachloride	....	0.10	....
Chlorine	6.6	0.05	330
Chloroform	....	0.17	....
Clay or earth	600.0	0.013	7,800
Copper chloride	1.0	0.50	500
Copper oxide	....	0.65	....
Copper sulfate	1.9	0.20	380
Cresol	5.6	0.13	730
Dichloroethyl ether	1.4	....	....
Dibutyl phthalate	....	0.30	....
Diethylene glycol	0.5	0.16	80
Di and monoethanolamines	....	0.24	....
Ethyl acetate	....	0.115	....
Ethylene dibromide	135.0	....	(¶)
Ethylene dichloride	142.0	0.09	(¶)
Fats, animal	....	....	....
Ferric sulfate	....	0.015	....
Ferrous sulfate	....	....	....
Formaldehyde	....	0.04	....
Furfural	11.0	0.12	1,320
Glycerol	....	0.29	....
Graphite	....	....	....
Lead naphthenate	....	0.19	....
Lead oxide	10.0	0.22	2,200
Lithopone	1.3	0.08	104
Methyl ethyl ketone	10.2	0.145	1,480
Nitrobenzene	0.4	0.11	44
Oils, vegetable, fish, etc.	....	....	....
Propane	38.0	0.01	380
Phenol	16.8	0.155	2,600
Pine tar	....	0.09	....
Potassium hydroxide	2.0	0.10	200
Potassium nitrate	....	0.09	....
Potassium phosphate	....	0.16	....
Pyrethrum	5.0	0.10	500
Rosin	2.0	0.08	160
Sodium aluminate	....	0.085	....
Sodium bicarbonate	....	0.024	....
Sodium carbonate	70.0	0.015	1,050
Sodium chloride	79.0	0.01	790
Sodium dichromate	....	0.13	....
Sodium hydroxide	500.0	0.026	13,000
Sodium metaphosphate	....	....	....
Sodium nitrate	....	0.0225	....
Sodium phosphates	4.0	0.06	240
Sodium silicate	....	0.012	....
Sodium sulfate	7.0	0.02	140
Sodium sulfide	....	0.05	....
Sodium sulfite	....	0.07	....
Sulfur	131.0	0.025	3,300
Sulfur dichloride	4.0	0.035	140
Sulfur dioxide	6.8	0.045	306
Sulfur monochloride	....	0.04	....
Talc	4.5	0.008	36
Tetraethyl lead	475.0	0.60	284,500
Toluene	3.1	0.05	155
Tricresyl phosphate	....	0.37	....
Turpentine	16.5	0.10	1,650
Urea	....	0.07	....
Water treating agents, misc.	2.4	....	....
Wax, montan	....	0.23	....
Wool grease	....	....	....
Total, estimate‡ (excl. TEL)	6.6 billion		$308 million‡
Total, estimate‡ (incl. TEL)	7.1 billion		$593 million‡

*Excluding TEL. †Replacement is only $4.00 per lb. ‡Allowing for some duplication, for items not included, and for some freight. §Almost totally upper cylinder lubricants and de-icing agents (93%), which are relatively cheap. ¶Cost included TEL.

ANNOUNCING A NEW ORGANIZATION:

DOW INDUSTRIAL SERVICE

DIVISION OF THE DOW CHEMICAL COMPANY

formed to offer the CHEMICAL CLEANING SERVICES

formerly provided by

DOWELL

DOWELL DIVISION OF THE DOW CHEMICAL COMPANY

Dow Industrial Service will be an organization devoted exclusively to helping you solve maintenance and disposal problems. It will offer an expanded scope of operations designed to be of greater service to all types of industry.

- The new organization will offer the cleaning services proved in plants throughout the U. S. by Dowell during the past 20 years.
- Chemical cleaning personnel will be the same engineers and operators you have known in Dowell.
- Specialized cleaning equipment will be provided from the same stations and offices — located in major industrial areas.
- The research program which has provided many major advances in cleaning techniques and chemicals will be continued — and expanded.

Dow Industrial Service will welcome the opportunity to discuss your cleaning problems on all kinds of equipment in all industries—steam generators, process equipment, heat exchangers, towers, water and product lines, water wells and tanks.

The new organization will also offer consulting services, and a line of chemical products for use in water and waste treatment.

Dowell will continue to offer services and products to the drilling and producing segments of the oil industry.

For service or more information call the office or station near you. Or write Dow Industrial Service, 20575 Center Ridge Road, Cleveland 16, Ohio.

Chemical Cleaning Services for all industry

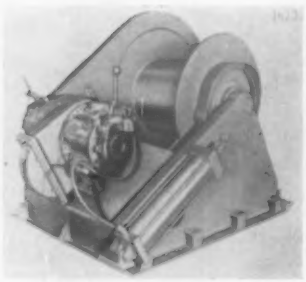
DOW INDUSTRIAL SERVICE

DIVISION OF THE DOW CHEMICAL COMPANY

DOW

▶ ▶ ▶ New Equipment Section

This week's SHOWCASE features . . .



Air powers hoist

. . . that lifts from 27,000 lb. at 37 ft. a minute to 3,700 lb. at 220 ft. a minute. Through a multiple roller chain, a five-cylinder, radial air motor (10, 17, or 23 hp.) with integral gear case drives the rope drum. Drum capacity: 2,300 ft. of ¾-in. wire rope. The entire assembly is mounted on a skid type of base for portability.

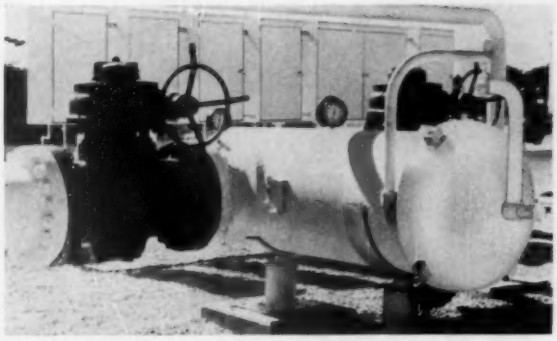
All controls for the JCP-120 hoist, including the throttle, brake, and clutch, are mounted on the hoist in the maker's standard model. But they can be removed and operated from a remote position. Over-all dimensions: 77 in. long, 48 in. wide, and 53 in. high. Source: **Joy Mfg. Co., Oliver Building, Pittsburgh 22.**

Kelly-extension drive

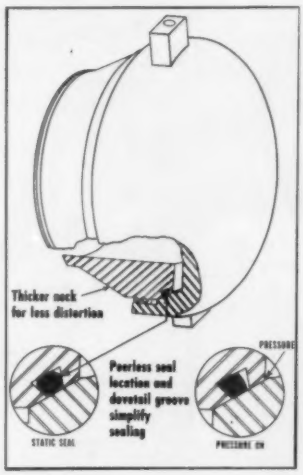
. . . is available for rental in the U. S., for sale in export. It can be useful as a means of transmitting torque to the drill string from as high as 30 ft. above the rotary table. With it, the maker says an operator can drill as much as 50 ft. without breaking circulation or pulling the drill string up to make a connection.

It is expected to prove particularly valuable on such jobs as diamond coring, fishing, washover, and spudding in of a new well when added weight or an extra collar is needed.

The kelly-extension drive can be installed or removed at any stage of operations without interrupting circulation. The maker points out that it accomplishes the same purpose as a power swivel while costing much less. Built to meet API specifications, the unit will fit any size or type of kelly without alterations to rig equipment. Rental rate: $35 a day, 5-day minimum. Source: **Drilling & Service, 6210 North Central Expressway, Dallas 6.**



Simplified O-ring closure made



. . . for such equipment as filters, strainers, blowdowns, scraper traps, and manways. The design uses an O-ring seal to achieve a tight seal regardless of fluid pressure. The unusual features are that the seal is located on the outer edge and a dovetail groove makes it easy to insert the O-ring and hold it in place.

Too, the seal is positioned away from possible sealing-surface damage. The cap hinge is an integral part of the closure. Installation requires only the welding of the closure weld neck with a circumferential weld. The opening device is designed for one-man operation. Source: **Sillers Engineering Co., Box 13165, Dallas.**

Want more facts about equipment or copies of product literature described in this issue?

Send this **Showcase Coupon**

to manufacturer at address shown in bold type after each item.

Product name, Model no., literature title or number: .....

.....

Described in OIL AND GAS JOURNAL - Issue of January 11, 1960

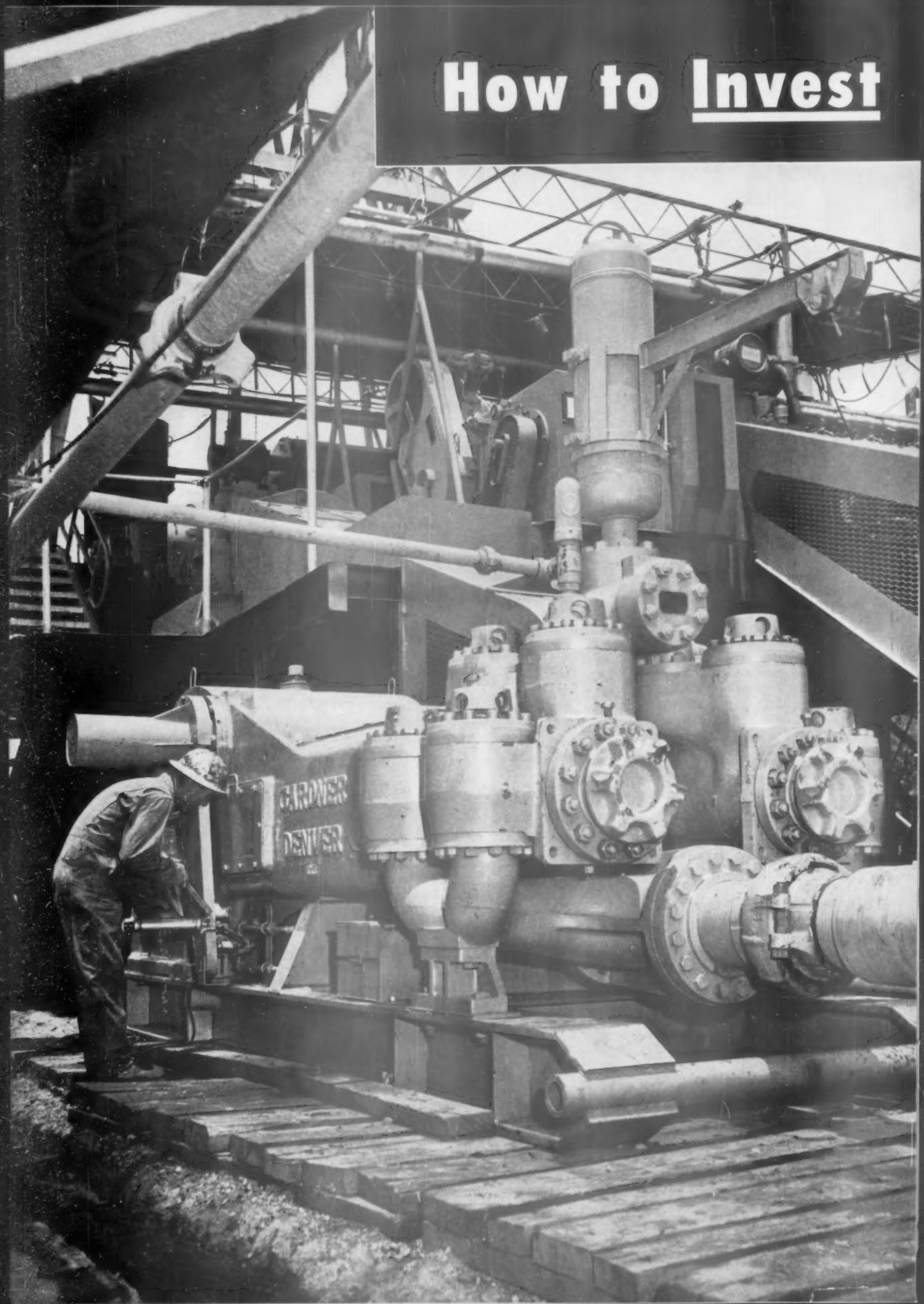
NAME..... TITLE.....

COMPANY.....

ADDRESS.....

CITY..... STATE.....

How to Invest



in Drilling Equipment

Drilling equipment well designed for your purpose, made to last, and serviced by a responsible supply company should rule out all other considerations. That's the difference between *buying* and *investing.*

You *know* from experience or observation that good design and long life are inherent in drilling equipment sold by J&L Supply. You *know* that J&L Supply has the organization, the parts inventories, and the determination to service what it sells.

Equipment universally respected by the drilling industry includes *Gardner-Denver Mud Pumps, Republic Hose, Ideco Rigs and Masts, J&L Wire Rope, and J&L Drill Pipe.*

J&L Supply sells the quality equipment you need and offers service facilities and policies designed to save you time and money at every step.

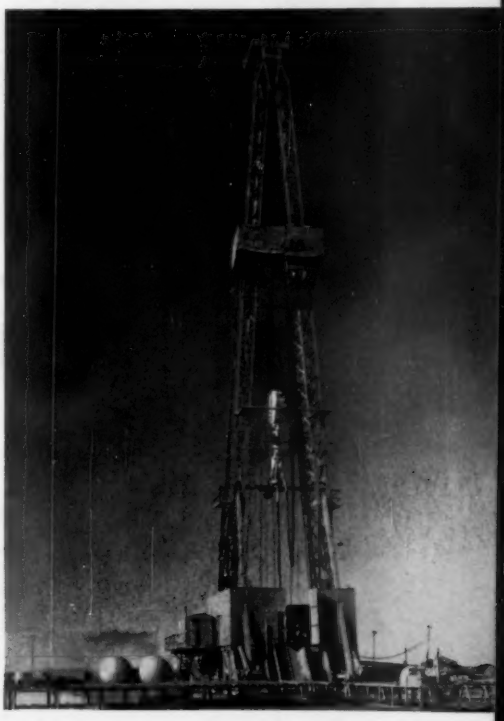
Remember, only quality equipment can give you the performance life that leads to real economy. Invest in quality and save at J&L.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

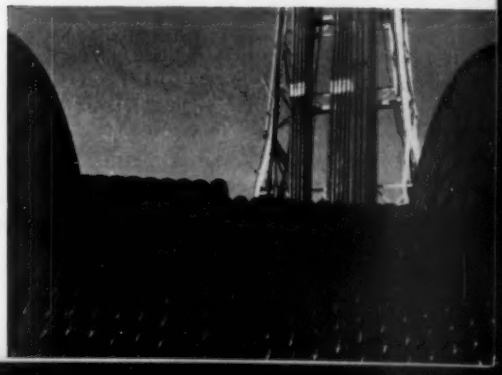
If it's sold by J&L . . . .
It's the best available 100

Above — J&L Drill Pipe is made in sizes and grades for drilling to any depth. Ask your J&L Supply man for technical details.



Above — Ideco Full-View Mast. Ask for literature on Ideco Drawworks, Rotaries, Blocks, Masts and Rambler Rigs.

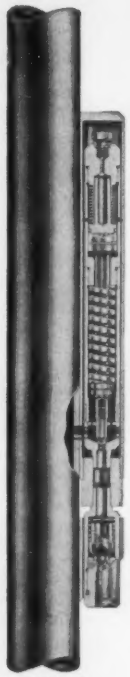
Below — There is real assurance in the rugged strength of J&L Wire Rope.



Gardner-Denver Mud Pump at work in Mississippi. Ask your J&L Supply man for illustrated literature. Parts stocked at near-by J&L Supply stores protect your Gardner-Denver investment wherever you drill.

GAS LIFT AUTOMATION

with Macco "Spring" Fluid Operated Valves
("No Charge" Bellows)



CM2-FS

The MACCO Fluid Operated Valve is actuated by a predetermined hydrostatic fluid head in the tubing.

INTERMITTENT FLOW... The intermittently produced gas-lift well normally has a producing capacity of less than 500 bbls. per day and fluid is produced at intervals in "slugs." When the fluid column in the tubing builds up sufficient pressure, at the valve, to overcome the valve opening pressure, the valve stem is lifted off its seat. Then gas from the casing is injected through a normally closed check valve into the tubing, discharging the accumulated heat of fluid.

When the tubing pressure opposite the valve becomes lower than the valve opening pressure, the valve immediately closes until another predetermined head is built up in the tubing and the cycle is repeated. Subsequent action is automatic and unloading from valve to valve is automatic. No time cycle surface controllers or "purgers" are necessary.

CONTINUOUS FLOW . . . If a well condition is such that the flowing bottom hole pressure will feed past the point of injection at a rate sufficient to maintain a pressure opposite the valve greater than the valve opening pressure, the delivery of fluid from the flow string is constant.

For further information regarding lifting with Macco Fluid Operated Valves, write for Brochure Nos. 3-10, 3-11, 3-12 & 3-13.

MACCO

MACCO OIL TOOL COMPANY, INC.
1521 Prince P. O. Box 7288 Houston 8, Texas
Phone UN 1-1253

For Constant, Uninterrupted POWER FLOW in the OIL FIELDS

You'll Never Go Wrong with

FIELDMASTER
BALL BEARING MOTORS

Here's Why...

They are specifically designed to overcome the unusual conditions of Oil Field requirements, and there is a type and H.P. built to fit your exact needs. Unexcelled since they are...

- DRIP PROOF
- VERMIN PROOF
- MOISTURE PROOF
- CORROSION RESISTANT
- FORCED AIR COOLED
- HAVE SEALED TERMINAL PORT

SEMI-ENCLOSED — normal or medium slip, 3 phase, 60 cycle. Has prelubricated ball bearings in semi-enclosed protected housing, 40 degree C rise. Built for continuous duty. High Torque, low starting current. Extra insulating coating throughout.

TOTALLY ENCLOSED — Fan cooled, normal or medium slip, 3 phase, 60 cycle. Has prelubricated ball bearings, totally enclosed FAN cooled 55 degrees C rise, for continuous duty. High Torque — low starting current. Extra insulating coating throughout.

Write for fully descriptive literature

BETHLEHEM STEEL CO. Supply Division **Tulsa, Oklahoma**
Manufactured by Valley Electric Corporation, St. Louis 8, Mo.

SHOWCASE . . .

New Equipment

Fuel oil pumped

. . . automatically from a storage tank to a burner up to 20 ft. above the tank at rates up to ⅞ gal. an hour with a new unit now available called the AP Oilifter. It can be used with vaporizing type of oil-burning furnaces, rotary type of oil burners, and conversion oil burners.

Easily installed, the unit need only be turned on at the beginning of a heating season where it will maintain a uniform head of oil. Installation requires ¼-in. o.d. copper tubing for the inlet and ⅜-in. tubing or ¼-in. pipe for the outlet.

A diaphragm pump driven by a 22-watt shaded-pole motor is used. Delivery time for the unit is 2 weeks. List price is $31.35. Source: **Controls Co. of America, 2450 North Thirty-second Street, Milwaukee 45.**

●

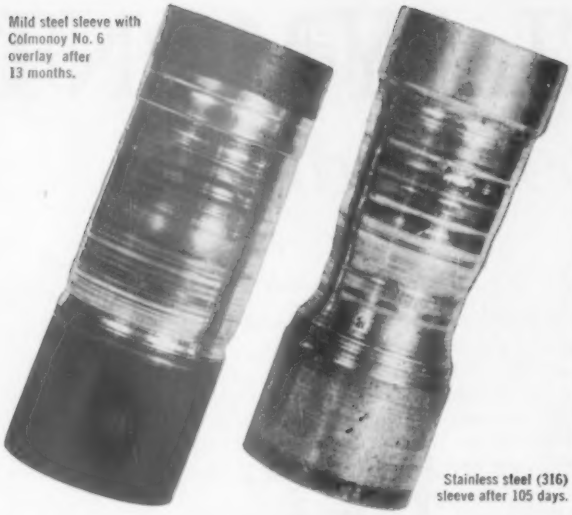
Glass-lined pipe

. . . can be field cut to required lengths. Now available is this new F-C Glasteel pipe (glass inside, steel outside) that has more than twice the glass thickness of previous glass-lined pipe.

Rated at 150 psi. and available in 1½, 2, and 3-in. diameters, the pipe makes a way to move highly corrosive fluids, including all acids except HF, at temperatures up to 350° F. and mild alkalies at moderate temperatures.

According to the maker, corrosion and abrasion resistance are about doubled over older glass-lined pipe.

The pipe cannot only be cut to fit and threaded in the field by plant maintenance crews, but it need only be supported in the same manner as carbon-steel or other types of pipe. The special tools needed are special threading dies and a small fire-polishing furnace. The maker says their initial cost can be rapidly recovered. List price for 10-ft. pipe length with flange for 1½-in. diameter is $111. It is $140 for a 3-in. diameter. Source: **Pfaudler Co., 1098 West Avenue, Rochester 11, N. Y.**



Mild steel sleeve with Colmonoy No. 6 overlay after 13 months.

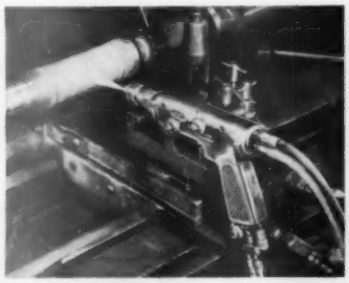
Stainless steel (316) sleeve after 105 days.

Colmonoy Hard-Surfaced Mild Steel Pump Sleeve Lasts Longer Than Stainless Steel Sleeve

Here's dramatic evidence of how Colmonoy hard-surfacing alloys can lower maintenance costs. Both pump sleeves (above) served in a Desalta charge pump, moving crude oil. The one at the right, made of 316 stainless steel, was photographed after 105 days in service (involving eight packing changes). The other one, made of mild steel with a sprayed overlay of Colmonoy No. 6 alloy, served over three times as long (with just one repacking), yet suffered much less wear.

Colmonoy No. 6 is a wear-resistant nickel-base alloy incorporating chromium borides and carbides. The powdered alloy is sprayed on with the Colmonoy Spraywelder, as shown. The smooth sprayed overlay is then fused to the base metal with an oxy-acetylene flame to form a solid, non-porous, wear-resistant overlay.

WRITE RIGHT NOW
For the Colmonoy Spraywelder Catalog and Hard-Facing Manual No. 79



HARD-SURFACING AND BRAZING ALLOYS

WALL COLMONOY
CORPORATION
19345 John R Street • Detroit 3, Michigan

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From WESTON—

The NEW '4,000 SERIES'

These Heavy Duty Bimetal Thermometers Offer **7** Points of Distinction:

- **All-stainless construction—including welds.**
- **In-line scales and pointers eliminate parallax error.**
- **Removable bezels permit easy window replacement—even in the field.**
- **New composition gaskets protect against "breathing" and leakage.**
- **Accuracies of ±1% of range are assured.**
- **External adjustment feature (located at side of case) is standard equipment.**
- **Full line of sizes, stem lengths and ranges.**

3-inch and 5-inch diameter heads . . . back and bottom connected models with rotatable scales . . . ranges cover an area from —100° to 1000° F. or —100° to 500° C. . . . stems up to 72" available.

For full information and name of stocking distributor, contact your local Weston representative . . . or write to Weston Instruments, Division of Daystrom, Inc., Newark 12, N.J. In Canada: Daystrom Ltd., 840 Caledonia Rd., Toronto 19, Ont. Export: Daystrom Int'l., 100 Empire St., Newark 12, N.J.

WESTON A DAYSTROM UNIT

Bi-metal Thermometers

WORLD LEADER IN MEASUREMENT AND CONTROL

Remember CLAYMONT

TO fabricators and equipment manufacturers, the Image of CF&I means single-source service for many of their steel plate requirements. This giant steelman reflects the integrated steel production and plate fabricating facilities of CF&I's Claymont, Delaware plant.

Claymont makes its own steel, rolls its own plate and performs every plate-fabricating operation, exercising step-by-step quality controls within the Claymont plant. Consequently, steel plate availability is no problem, and customer specifications are met exactly.

Small or large-quantity orders are handled with equal facility. Quick shipments from stocks are available on many items, and delivery promises are kept on special-to-order production.

Whether you need an added source or want a single source for steel plates and steel plate products, contact Claymont. Full details and prompt service are available through any CF&I sales office—and there's one near you.

for steel plates... heads... fabricated plate products

Claymont Steel Plates

CARBON—to all standard ASTM and AISI specifications.

ALLOY—including nickel-bearing ASTM specifications A-203 and A-353 for liquid oxygen storage and other low temperature applications . . . "chrome-moly" ASTM specification A-387 (all grades) for high temperature and high pressure applications . . . as well as ASTM specifications A-202, A-204, A-225, A-302 and AISI specifications 4140 and 4130.

STAINLESS-CLAD—provides the same protection against corrosion, abrasion and contamination as solid stainless—*plus* the economy of carbon steel backing plates. Cladding and backing are inseparably bonded together. Claddings are available in thicknesses from 5% to 50% of total plate gage. AISI stainless specifications 304, 304L, 316, 316L, 316Cb, 321, 347, 405, 410, 430 are provided. ASTM A-263 and A-264 specifications can be supplied also.

CLAY-LOY high strength low alloy steel plates—comply with ASTM specification A-242. Ideal for structural and equipment applications where weight-saving is important.

CF&I LECTRO-CLAD nickel plated steel plates—give positive protection against product contamination and discoloration, at less cost than solid nickel.

Claymont Spun and Pressed Heads

Claymont has complete facilities to produce spun or pressed heads . . . in diameters from 9 inches to 19 feet . . . in gages from 3/16" to 6" . . . in the following shapes: standard or ASME flanged and dished, conical, hemispherical, elliptical, flanged and reverse dished, dished only, flared and dished, flanged and shallow dished, flanged only, and large segmented and welded shapes. Metals include carbon, alloy, stainless or stainless-clad steels; aluminum, aluminum alloy, brass, bronze, copper, Hastelloy, inconel, monel, and other ferrous and non-ferrous metals supplied by our customers.

Large stocks of the more popular sizes of Claymont Heads, flanged and dished in carbon steels, are maintained at the following CF&I warehouses:

Chicago • Claymont, Delaware • Houston • Los Angeles
San Leandro, California • Tulsa

Claymont also manufactures a complete line of fittings for pressure vessels, such as manhole and handhole fittings, elliptical manhole rings and storage tank manhole frames and covers.

Claymont Fabricated Steel Plate Products

Claymont's production-line fabrications shop is completely equipped to convert the steel plate of your choice into completely-fabricated assemblies or simple, single-operation parts or components. Job-shop facilities of all kinds are available to furnish welded, rolled, sheared, flame-cut, pressed, punched or machined products to exacting specifications. Claymont's fabricated structural weldments range from 120-ton fully-welded sections to such items as bearing assemblies, base and tie plates, wedges, gussets and straps.

Use Claymont's complete plate fabrications facilities as an extension of your own shop. Have difficult, time-consuming operations performed *before* the steel plate is delivered, and save shipping and handling on the part of the plate that you can't use.

If you use any of the steel plate products listed above, or large diameter API Pipe, contact the nearest CF&I sales office.

Claymont Steel Products

THE COLORADO FUEL AND IRON CORPORATION

CF&I STEEL

In the West: **THE COLORADO FUEL AND IRON CORPORATION**—Albuquerque · Amarillo · Billings · Boise · Butte · Denver · El Paso · Farmington (N. M.) · Ft. Worth · Houston · Kansas City · Lincoln · Los Angeles · Oakland · Odessa · Oklahoma City · Phoenix · Portland (Ore.) · Pueblo · Salt Lake City · San Francisco · San Leandro · Seattle · Spokane · Tulsa · Wichita

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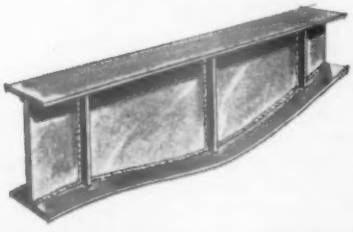
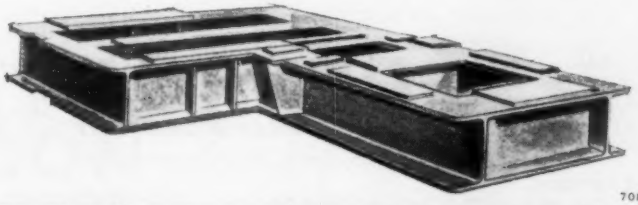
CF&I OFFICE IN CANADA: Montreal · **CANADIAN REPRESENTATIVES AT:** Calgary · Edmonton · Vancouver · Winnipeg





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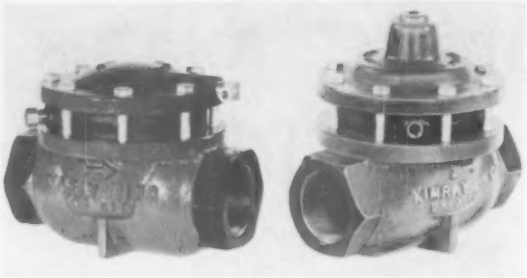
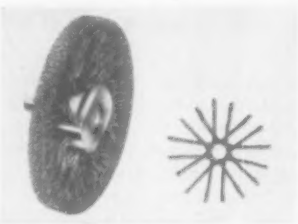
Latest motor-valve development



. . . is this "5:1" series valve. Most of the maker's low-pressure valves have a full line-size inner valve. In contrast, this valve has a reduced inner valve. The area is 30% of full line size. This allows the valve to be used on oil and gas separators and liquid meters where a 30-psi. maximum pilot supply is available to actuate valves operating at up to 125 psi.

The valve comes in single or double-acting types with stainless-steel trim, and soft Buna-N seat for pressures to 125 psi. Sizes available: 2 through 4-in. screwed or flanged and 6-in. flanged. Delivery: immediate. Price: from about $55 for a 2-in. single-acting valve with screwed ends to $275 for a 6-in. double-acting valve with flanged ends. Source: **Kimray, Inc., 52 N. W. Forty-second Street, Oklahoma City 18.**

●

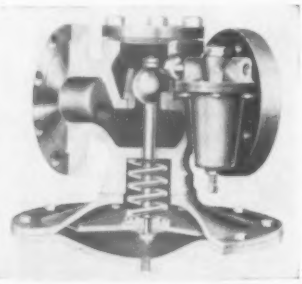


Wire-brush costs

. . . can be reduced with a new type of circular wire brush for electric or pneumatic tools now available that has easily removable and replaceable segments. When the wire brush is worn, instead of buying a totally new brush, just remove the brush segment and put a new refill in its place. The other brush parts last indefinitely.

The Dynamic refillable brush comes in a 3½-in. circular-wheel type with refills consisting of eight segments that are inserted in a notched ring. Delivery time is about 10 days. The brush sells for about $3.50, and replacement brushes sell for about $2. Source: **Hemo-Dyne Corp., 7412 Maie Avenue, Los Angeles 1.**

●



Steam pressure

. . . is easily adjusted with the No. KP-4 external pilot-operated steam pressure reducing valve now being produced. Although quite sensitive, the valve is simple in operation. To adjust pressure, merely turn the adjusting screw on the pilot valve.

Proud Bearer of the Penrod Banner

PENROD OPERATES *3 offshore mobile platforms*
6 inland barges — 16 land rigs

Drilling to Any Depth with **PREMIUM EQUIPMENT**
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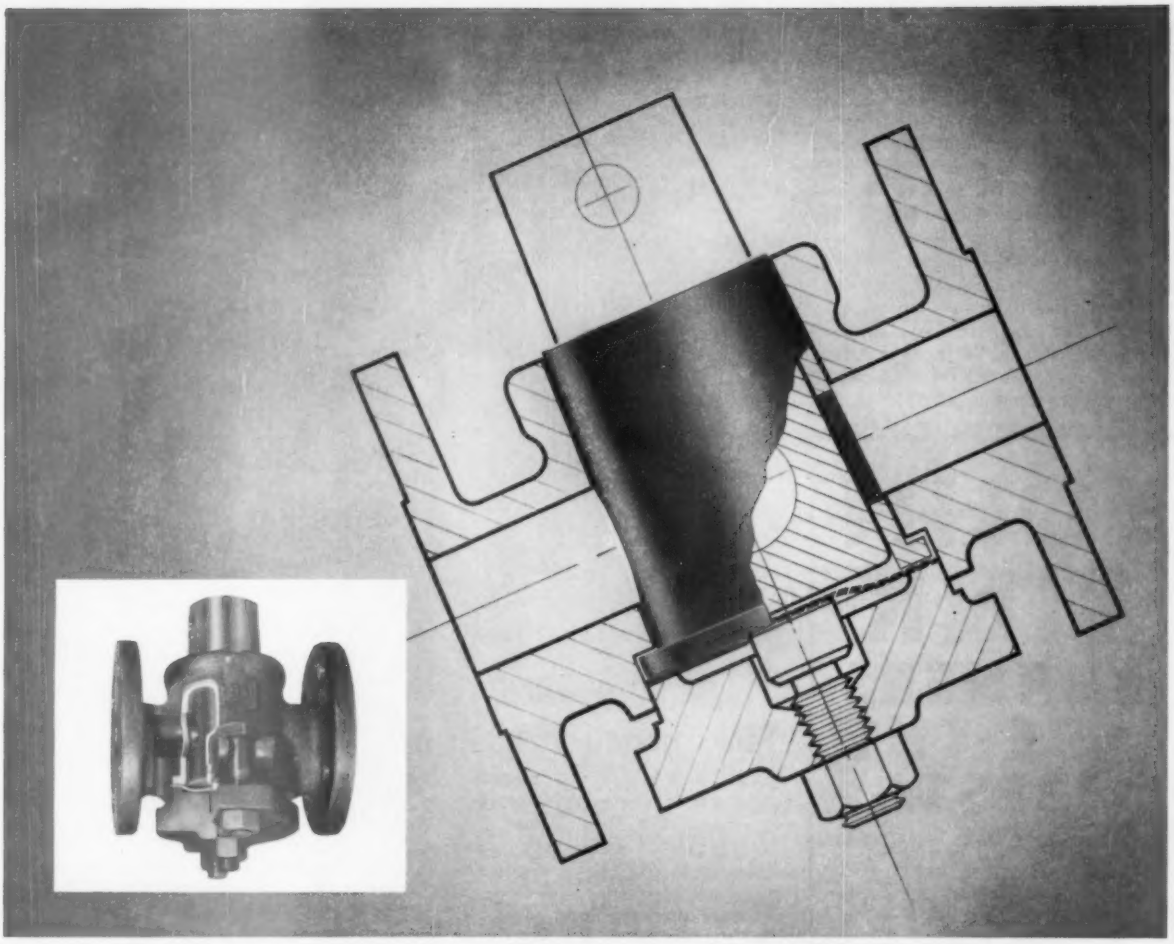

Valves using durable TFE resins turn easily, seal tight, can't "freeze"

Exceptional performance of the DURCO* plug valve shown above is assured by the use of a reinforced TEFLON TFE-fluorocarbon resin for the sleeve and diaphragm. The low friction TFE resin eliminates the need for lubrication, thus permitting a simplified valve design and reducing maintenance problems. Problems of leakage and "freezing" are also eliminated. In one application these plug valves, handling corrosive chemicals at 270°F., have already lasted 36 times as long as valves formerly used.

Du Pont TEFLON TFE resins are rated for continuous duty up to 500°F. They are inert to virtually all chemicals and solvents. Even in cases where service conditions are not exceptionally difficult, the use of TFE resins provides increased reliability of performance and lower maintenance costs. Their unique combination of properties has made possible a variety of improvements in petrochemical designs and processes. For more information that will help you evaluate TFE resins for use in *your* operations, write to: E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department, Room T-30111, Nemours Building, Wilmington 98, Delaware.

In Canada: Du Pont of Canada Limited, P. O. Box 660, Montreal, Quebec.

*Registered trademark of the Duriron Co., Inc.

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TEFLON®

TFE-FLUOROCARBON RESINS

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

TEFLON is Du Pont's registered trademark for its fluorocarbon resins, including the TFE (tetrafluoroethylene) resins discussed herein.

SHOWCASE . . .

New Equipment

The main valve diaphragm is made of stainless steel to permit use of high pressure and temperature. The control spring is located outside the path of steam flow. The valve comes in sizes from ¾ to 4 in. with bronze, semisteel, or cast-steel body. Screwed ends are offered in sizes up to 3 in. Flanged bodies are offered in sizes from 1¼ to 4 in. Working pressures range from 5 to 150 psi. Working temperatures range up to 525° F. Delivery time: about 1 to 2 weeks. Prices range from about $90 to $800. Source: **Klipfel Valves, Inc., 1075 Lincoln Avenue, Hamilton, Ohio.**

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Special Process Heating Equipment

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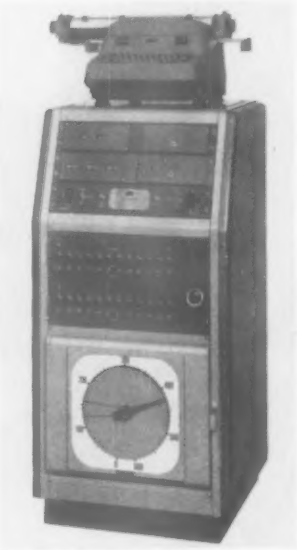


Tanks gaged

. . . and data logged automatically with this latest development in data-logging equipment, the Data Master Type 3 Logger. It, the maker says, measures fluids in tanks, checks the temperature, and sets off an audible or visual alarm at predetermined limits.

It can log data for a complete tank farm and deliver an automatically typed or punched tape record around the clock.

The instrument can also calibrate tanks, gage water interface, and monitor a single tank when required.

Of modular construction, the logger is 48 in. high, 24 in. wide, and 24 in. deep. It is mounted on casters and comes with a top-mounted typewriter. Price: $10,000 up. Delivery time: 4-6 months. Source: **Hanson-Gorrill-Brian, Inc., 85 Hazel Street, Glen Cove, N. Y.**

Catalysts analyzed

. . . with the latest development in instrumentation, a new type of sorptometer manufactured by license from Shell Development Co. The Model 212 sorptometer passes a known helium-nitrogen mixture through a sample cooled by liquid nitrogen. The change in the mixture's nitrogen concentration is measured by a thermal conductivity detector and inscribed as a peak on a potentiometer recorder chart.

A second peak is then obtained by warming the sample and measuring the amount of nitrogen released. The two peaks' areas are proportional to nitrogen adsorbed and desorbed. A simple calculation then gives the required data.

The instrument promises to permit simple yet accurate studies of surface area and other phenomena. Refiners are expected to find the instrument useful in routine analyses of uniform samples such as silica-alumina cracking catalysts. Dimensions: 33 in. high, 22 in. wide, and 15 in. deep. Delivery time: 3 months. Price: about $1,475. Source: **Perkin-Elmer Corp., Norwalk, Conn.**

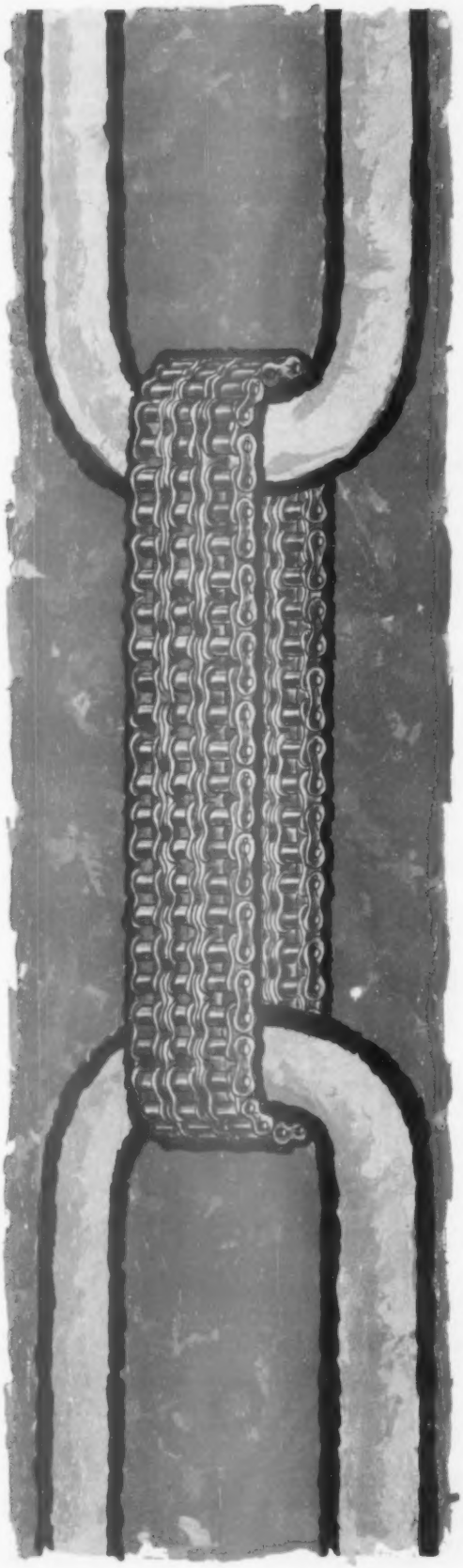
W. C. NORRIS

Field Tested and Approved

150 psi working pressure

WRITE FOR NEW VALVE BULLETIN P. O. Box 1739, Tulsa

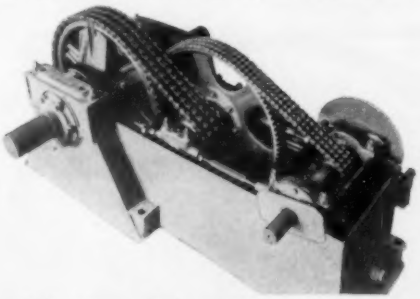
VALVES



"CHAINED" Against Downtime

Parkersburg Chain-Driven Pumping Units are built for rugged heavy-duty service, and will produce profitably with minimum time out for maintenance and repairs. High-efficiency chains are factory-set, permanently quiet, designed for in-the-field adjustments or replacements. Lightweight oil bath minimizes starting torque and frictional power losses in cold climates. No wonder . . .

15,000 PARKERSBURG chain-driven pumping units are giving trouble-free service the world over



The Parkersburg chain reducer, installed in a totally enclosed welded steel case, is both durable and flexible. Double-reduction ratios of approximately 23 to 1, plus a wide range of V-belt sheave sizes, make these chain units serviceable at any pumping speed. For the full line in standard or portable chain-driven pumping units, **look first to Parkersburg.**

THE PARKERSBURG RIG & REEL COMPANY
Division of Parkersburg-Aetna Corp.
PARKERSBURG • HOUSTON • COFFEYVILLE

Parkersburg Pumping Units Are Available Through the Following Supply Stores: American Pipe & Supply Co., Beacon Supply Co., Bovaird Supply Co., Canadian Equipment Sales & Service Co., Ltd. (Canada), Franklin Supply Co., Franklin Supply Co., Ltd. (Canada), Houston Oilfield Material Co., Inc., Industrial Supply Co., Iverson Supply Co., Midland Supply Co., Inc., Mountain Iron & Supply Co., Oil Equipment, Ltd. (Canada), The Producers Supply & Tool Co., Republic Supply Co., Rodman Supply Co., Superior Iron Works & Supply Co., United Supply & Manufacturing Co., Wilson Supply Co.

SHOWCASE . . .

New Literature

Density-measuring

. . . controller Bulletin LSG describes the method of operation, specifications, and advantages of the Model LSG density gage which can be used to maintain density of products from equipment such as evaporators and thickeners at high output.

The measuring unit bolts around slurry or liquid pipelines with diameters from 4 to 14 in. and uses gamma radiation to sense density changes. According to Bulletin LSG, signals actuate return-line control valves or pumps and continuous recordings can be made. Source: **Ohmart Corp., 2236 Bogen Street, Cincinnati 22.**

Equipment

. . . for the process industries is displayed in a new 32-page catalog guide just published. Obtainable free for the asking, Catalog 25C6177P offers: (1) descriptions of compressors, vacuum, centrifugal, axial flow, and turbine pumps, and valves for fluid flow; (2) crushers and grinding and roller mills for disintegration, mixing, and agglomeration; (3) vibrating and gyratory screens for dry separation; (4) blade mills, pool-washing screens, and log washers for liquid separation; and (5) kilns, dryers, slakers, pelletizers, coolers, and liquid heaters for heat transfer.

The guide also covers electrical equipment for the complete process plant, electronic metal detectors, water-conditioning equipment, chemicals and service, as well as car shakers, lift trucks, and tractors. Source: **Allis-Chalmers Mfg. Co., 1126 South Seventieth Street, Milwaukee 1.**

Heat exchangers

. . . of immersion type and circulating steam jets for heating or cooling corrosive solutions in all types of tanks are detailed in new 12-page illustrated Bulletin S-6620. Separate sections on plate, bayonet, and coil-type immersion heat exchangers include general descriptive, installation, and operation information.

Dimensioned sketches of each type give complete construction details, while tables present information on weights and effective surface areas. Specifications on circulating steam jets include dimensions and installation instructions.

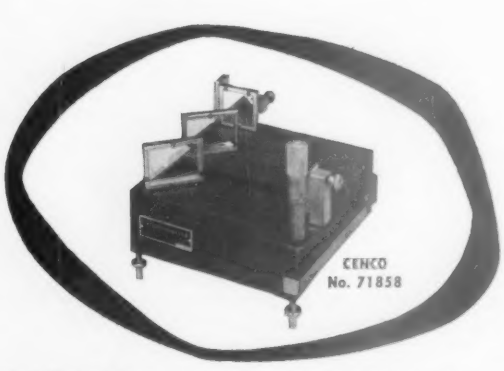
The publication also contains nomograms and curves which present design information, and sample calculations to illustrate proper uses of the equipment under a wide range of operating conditions. Source: **National Carbon Co., 535 Fifth Avenue, New York 17.**

Typical fabrications

. . . for chemical petroleum, petrochemical, water conditioning, and power generation are presented in a new obtainable catalog. Welded vessels include shells for some of the world's largest deaerating feed-water heaters, demineralizers of Type 304 stainless steel for a marine nuclear plant, and complex stainless-clad epoxy-resin reactors. Nearly 50 pressure vessels are described and illustrated. Source: **Pottstown Metal Products Div., Cochrane Corp., 3107 North Seventeenth Street, Philadelphia 32.**

Industrial-controls

. . . catalog lists such products as automatic temperature, pressure, level, and flow controls, along with count-



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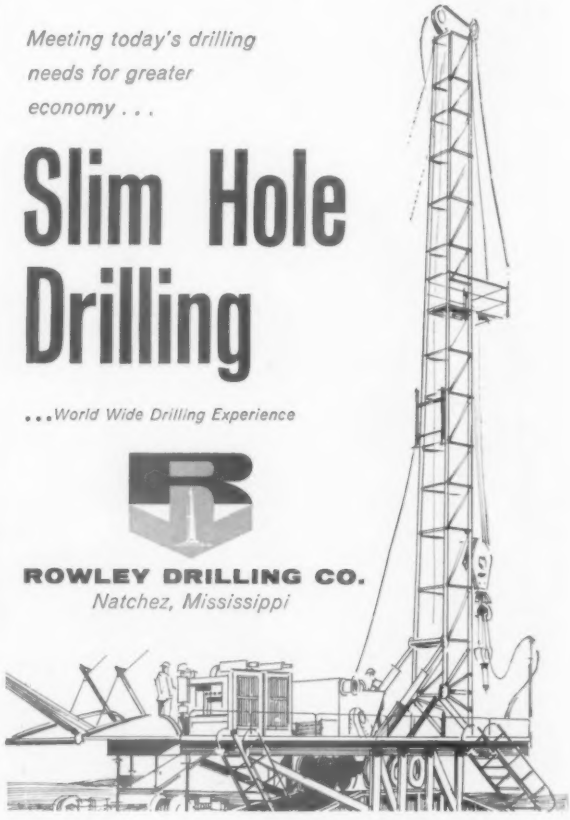

ROWLEY DRILLING CO.
Natchez, Mississippi

ers, switches, and automation controls. Other items illustrated and described are industrial actuators, combustion instrument controls, controller indicators, and pressure indicators.

A special section deals with Hydramotors, electrohydraulic actuators having many patterns, designs, and valve-body materials. The publication also presents relays, transformers, and time switches. Source: **Literature Control Section, General Controls Co., 801 Allen Avenue, Glendale 1, Calif.**

Transistorized

. . . service channel equipment now available for 6-kmc. microwave is described in Bulletin ECM 112 available gratis upon request. The new equipment is designed to simplify microwave-system servicing. Source: **Communication Products Dept., General Electric Co., Lynchburg, Va.**

Blast-cleaning

. . . nonplug machines are described in new Catalog 594 now available. It contains: (1) information on both open and closed-top pressure-type sandblast machines; (2) nozzles to be used in various operations; (3) data tables on ratios of nozzle bore sizes to compressor capacities; and (4) operator accessories.

The catalog also introduces data on a new high-velocity blast nozzle which multiplies surface-area coverage that can be cleaned compared to conventional nozzles. This is accomplished without equipment or abrasive alterations. Source: **Sanstorm Mfg. Co., P.O. Box 1173, Fresno, Calif.**

Bronze gate valve

. . . known as Type K-92 for working pressure of 125 psi., is introduced in a new two-page literature piece. Included are photographs, dimensional drawings, and valve features. The bulletin also describes a new inlet check valve and a combination six-way fill box wrench. Source: **Barca International, Inc., 308 Springfield Avenue, Berkeley Heights, N. J.**

Tubing and pipe

. . . made of Hastelloy Alloys B and C, is outlined in a bulletin which describes applications of the corrosion-resistant alloys along with their resistance to corrosive fluids. Tables show the comparative alloy resistance to such corrosive media as hydrochloric, phosphoric, and sulfuric acids, nitric and oxidizing acid mixtures, organic acids, chlorine and hypochlorites, and acid salts at specified concentrations and temperatures.

Other tables in the six-page publication show the chemical analysis and physical and mechanical properties of the two alloys, as well as size ranges available and tolerances of pipe and tubing. Another section deals with the workability of the corrosion-resistant steels. Source: **Alloy Tube Div., Carpenter Steel Co., Union, N. J.**

Fire-extinguishing

. . . systems and equipment are discussed in newly revised Folio 1-1, yours upon request. It lists principal causes of large-loss fires, advantages of using carbon dioxide, and examples of extinguishing installations in various industries.

The booklet illustrates typical systems for protecting generators, flammable liquids, paint spray rooms and booths, tanks, and pumping operations. It also describes components and control of extinguishing systems. Source: **Cardox Div., Chemetron Corp., 840 North Michigan Avenue, Chicago 11.**

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...less than 2% maintenance!

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FRICTIONAL TUBING ANCHOR

U.S. Patent No. 2,874,783

- Smooth gripping members hydraulically actuated
- No slips to replace
- Completely automatic
- Calibrated holding power
- No bleeder valve required
- Large by-pass area
- O-ring fluid seal
- Simple construction, minimum maintenance
- Installed above pump; automatically "sets," holding tubing in natural tension
- No drag on casing going in hole or coming out unless tubing is pulled "wet"
- Can safely be installed in perforated pipe

Compensates both up and down

Complete range of sizes for 4½" to 11¾" API Casing. Write for complete information.

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▶▶▶ Equipment Men Notes

SIE appoints 3 representatives

. . . to handle test-instrument sales. Named were Comptronics, Seattle; Pat Lind Electronics Co., Circle Pines, Minn.; and M. P. Odell Co., Westlake, Ohio. Southwestern Industrial Electronics Co., a Dresser division, makes precision electronic test instruments for field or laboratory use.

C. Lee Emerson is elected veep

C. L. Emerson

. . . in charge of sales by Kaiser Steel Corp. directors, reports C. F. Borden, executive vice president and former vice president in charge of sales. Emerson had been general sales manager since 1954. Emerson joined the Kaiser organization in 1942 as materials engineer at the Richmond, Calif. shipyards. Three years later he was transferred to Kaiser's sales department. He served as service manager in the southern district sales office, Los Angeles, from 1945 to 1947, when he was appointed assistant southern district sales manager. In 1949 Emerson was named rolled-products sales manager, and from 1950 to 1954 he served as southern district sales manager.

MACCO SALES CONFERENCE held recently was attended by company representatives and distributors from the United States and Canada. The 3-day semiannual meeting took place in Houston. Those attending received reports on Macco Oil Tool Co., Inc.'s, engineering development projects, new pressure-controller equipment, paraffin scraper plungers, wireline and dual gas-lift equipment. New sales tools and techniques for use of independent distributors were presented. Displays of actual working equipment were used to show new lines of production equipment.

Dow forms German subsidiary

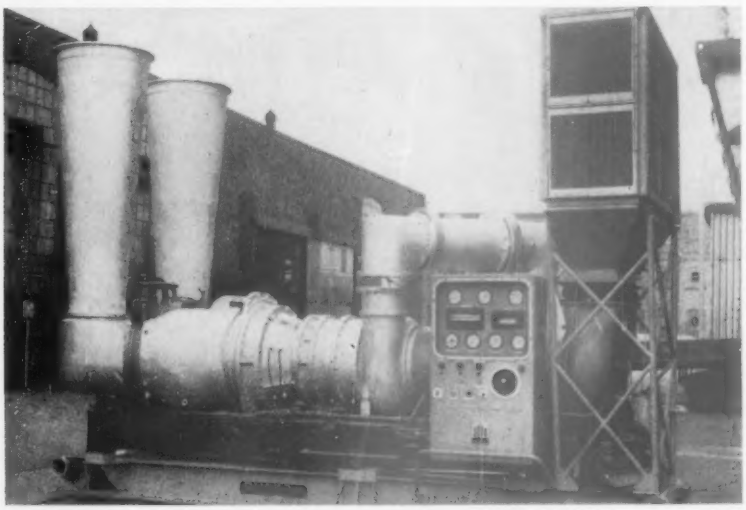
. . . known as Deutsche Dow Chemie GMBH, with headquarters in Dusseldorf, Germany, announces C. B. Branch, president of Dow Chemical International Ltd. S. A. The wholly owned subsidiary will provide oil and gas-well operators with acidizing, fracturing, and cementing services.

Sales of Dow chemicals and plastics in Germany will continue to be handled by Otto Krahn, general sales representative, with offices in Hamburg, Dusseldorf, Hannover, Frankfurt, and Munich.

W. J. (Bill) Alexander to head

. . . Glenn Advertising's new Industrial Advertising Division to service the needs of technical and industrial advertisers in the Southwest. Alexander comes to Glenn from Continental Emsco Co. where he was sales-promotion manager, directing all advertising, sales promotion, and public relations.

He was advertising manager of Johnston Pump Co., Pasadena, Calif., when that company merged with Emsco Mfg. Co. of Los Angeles in 1955. Alexander served as advertising director of the combined companies until 1957, when the merger of Continental Supply Co. and Emsco Mfg. Co. took place. He then was moved to Dallas when Continental Emsco's headquarters were set up in Texas.



GAS TURBINE of Ruston & Hornsby, Ltd., is one of a pair of the units recently delivered to Iranian Oil Services, Ltd., for pumping crude oil. Skid of the 1,260-b.hp. TA gas turbine is 17 ft. long and 3 ft., 6 in. wide. It's bolted to a conventional TA bed frame. Auxiliary equipment made integral with the turbine unit and pump includes an air filter, air-blast oil cooler with mechanically driven fan, a 3-kw. alternator to supply local services, and the instrument and control panel. The alternator, belt-driven from the shaft which couples the turbine to the pump, feeds a battery charger and makes the set independent of a main electricity supply for starting. It also provides current for the local lighting of the turbine and pump.

Gil A. Lastrapes, Jr. is named

. . . production valve salesman representative in the New Orleans area by Grove Valve & Regulator Co., Oakland, Calif. During the past 12 years, Lastrapes has been with Rector Well Equipment Co., Orbit Valve Co., and Oil Center Tool Co., all in the Gulf Coast area. In his new capacity, he will serve Grove customers in the Louisiana Gulf Coast region and will locate at Harvey, La.

Four representatives appointed

. . . by Industrial Silencer Division of Burgess-Manning Co. Representatives and their territories are: Barth Engineering Co. of Oakland, northern California and Nevada; E. N. Murray Co.

GET THE MOST

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FOR LONGEST LIFE – GREATEST SAVINGS

Taken individually, the savings you get from any of these Mission pump parts is substantial. But when used together, savings pyramid and down time is drastically reduced. Here's why: each of the Mission parts is the best of its kind that can be made. Mission engineering, Mission quality control, and Mission's experience and research in pumping drilling fluids have seen to that. The truth is that a Mission piston works better and lasts longer in a Mission liner that is specifically made for it. Liners also last longer with Mission pistons because the fabric back of piston rubbers reduces the danger of serious scoring or fluid cutting. So . . . don't just half save. Use only Mission parts on all your pumps. Save all the way.

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of Denver, Wyoming, Colorado, Montana, Idaho, western North Dakota, and parts of Nebraska; Adams Engineering Sales of Decatur, Ga., Georgia and southern South Carolina; and Carlson-Rutledge Co. of Cleveland, northeastern Ohio.

Orvilee Zickefoose becomes

. . . a member of the sales and service department of Hardy-Griffin Engineering Corp. to work in the Midland, Tex. area. Prior to his association with Hardy-Griffin, Zickefoose worked for Fluid Packed Pump Co. and Stanolind Oil & Gas Co.

W. C. Norris, Mfr. enlarges

. . . its engineering department by forming two divisions. One will be known as Sucker Rod Engineering & Research and will be headed by A. A. Hardy. The other division will be called General Products Engineering. J. A. Getty, Jr., sales manager of the company's central division, will be in charge of the latter.

Babcock & Wilcox Co. receives

. . . a contract to design and manufacture what will be the first shop-assembled carbon monoxide fired boiler in the world. Scheduled to go on stream this year, the unit, which also will be the first CO boiler in the Southern Hemisphere, will be part of a refinery extension in Montevideo, Uruguay, of the Administracion Nacional de Combustibles, Alcohol y Portland, which awarded the contract to Babcock & Wilcox.

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EXPERIENCED TESTING ENGINEERS

Appleton Electric announces

H. T. White

. . . the appointments of six new regional sales managers.

Involved are: H. T. White, assigned to the south-central sales region; W. G. Crum, east-central region; H. A. Buegel, western sales district; E. A. Hakanson, north-central region; E. A. McNeill, northeastern territory; and Z. B. Greer, southeastern sales region.

W. G. Crum

H. A. Buegel

New assignments for three

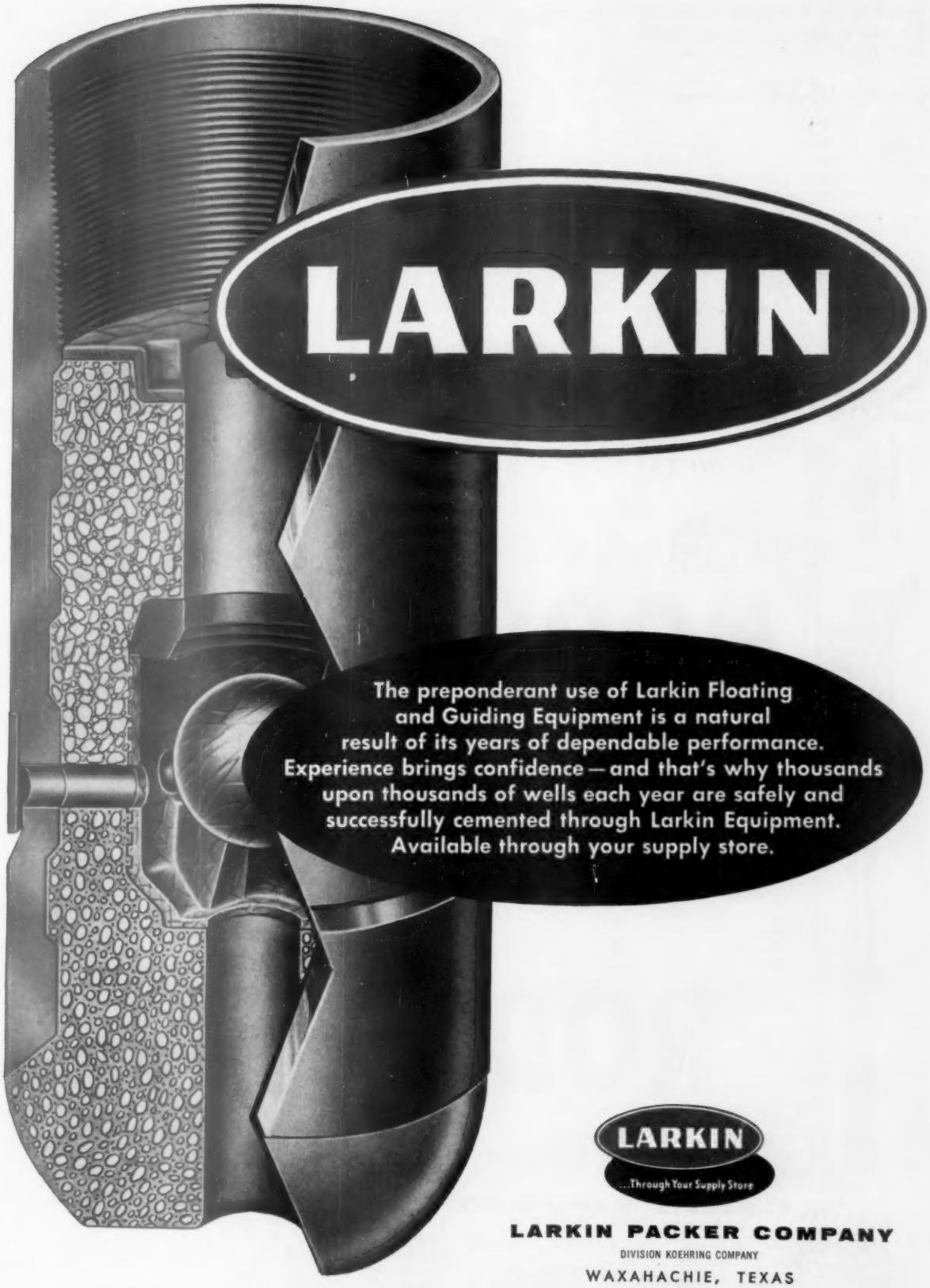
. . . key personnel in Seismograph Service Corp.'s well-logging division have been announced by James M. Bird, vice president in charge of the Birdwell Division of SSC.

Lloyd C. Fons, former midwest area manager for Birdwell in Robinson, Ill., has been named Birdwell's sales manager with headquarters in Tulsa. William Sturdevant, former Oklahoma area manager in Tulsa, will succeed Fons as midwest area manager. Joseph Ferguson, who has been area manager for SSC's continuous velocity logging operations, will become Mid-Continent area manager.

Frank A. Proctor, Jr. named

. . . special sales representative for the Fort Worth-Dallas area of Rector Well Equipment Co. He will also serve as a company representative to the headquarters offices of the distributors of Rector throughout the United States. The announcement comes from J. L. Pinkard, general sales manager.

Proctor has worked in Texas, Oklahoma, and New Mexico for the past 12 years, having been sales representative for Larkin Packer Co. and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The preponderant use of Larkin Floating and Guiding Equipment is a natural result of its years of dependable performance. Experience brings confidence—and that's why thousands upon thousands of wells each year are safely and successfully cemented through Larkin Equipment. Available through your supply store.
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WAXAHACHIE, TEXAS
LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPENDABLE PERFORMANCE

American Iron & Machine Works. He has been a sales engineer with Rockwell Mfg. Co. for the past 5 years.

Gerritt I. Wyckoff is manager

. . . of waterflood and well-servicing pump sales of U. S. Steel's Oil Well Supply Division, reports G. A. Hays, director of Oilwell's product sales. As a member of the division's general sales department, Wyckoff's duties will be division-wide, but his headquarters will remain in Tulsa. He has been with the division since June 1934.

Drilco Oil Tools, Inc. transfers

. . . Dick Norton to Lafayette, La. to be in charge of the Louisiana sales district. At the same time, Paul Myers was appointed to handle Drilco sales in the Oklahoma area replacing Norton. Myers is located in Oklahoma City.

Vinson Supply Co. adds

. . . Bill J. Storseth to its sales-engineering staff in Tulsa to specialize in the sales and specification of oil-country tubular goods in the Tulsa-Oklahoma City area. The report comes from Bailie W. Vinson, president of Vinson Supply.

Storseth comes to Vinson after 2 years as general manager of Independent Perforators, Inc. For 7 years prior to assuming that position he was employed by Lane-Wells Co. as district sales engineer in various parts of the country.

James S. Kone & Co. is named

J. S. Kone

. . . to represent Ralph N. Brodie Co., San Leandro, Calif., for pipeline and refinery meter sales in the Texas Panhandle and Eastern New Mexico areas. The report comes from E. D. Brodie, general sales manager. Kone Co., of Amarillo, Tex., specializes in process and pipeline equipment. James S. Kone is president of the organization.

Two promotions are announced

. . . in the engineering department of American Iron & Machine Works Co., Inc., by President M. G. McCool.

Ned Rodgers

Alvie Gooch

Ned Rodgers assumes the post of director of engineering. Formerly chief engineer, Rodgers has been with American Iron for the past 12 years. Alvie Gooch has been moved up to chief engineer. He was serving as assistant chief engineer and has been with the firm for 10 years.

Fred W. Dallas, Jr. is named

. . . special sales representative for Security Engineering Division, Dallas-based rock bit and oil-well drilling-tool manufacturer. In making the announcement, Claude L. Griffin, vice president, sales, reported that Dallas will operate from New Orleans, handling special sales-service projects in Southern Louisiana, Mississippi, and Alabama.

For the past 13 years, Dallas has been a sales engineer associated in drilling and production along the Texas and Louisiana Gulf Coast with Brown Oil Tools and Dia-Log Co.

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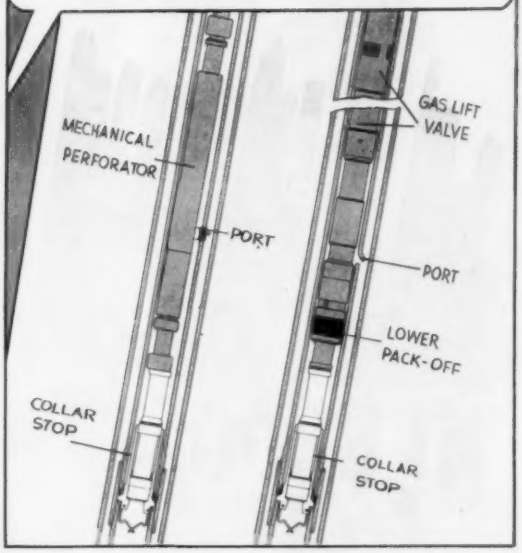

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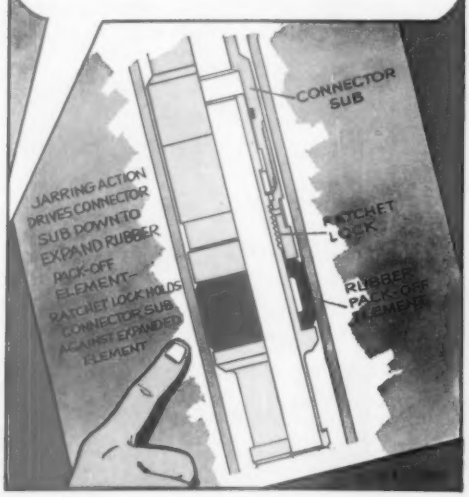
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RATCHET LOCK HOLDS CONNECTOR SUB AGAINST EXPANDED ELEMENT
RATCHET LOCK
RUBBER PACK-OFF ELEMENTS

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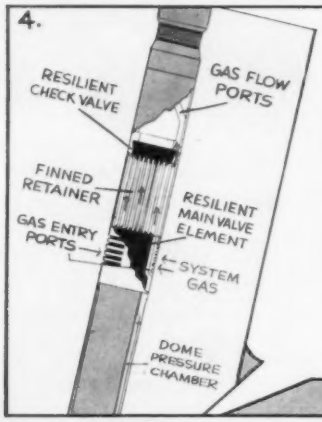

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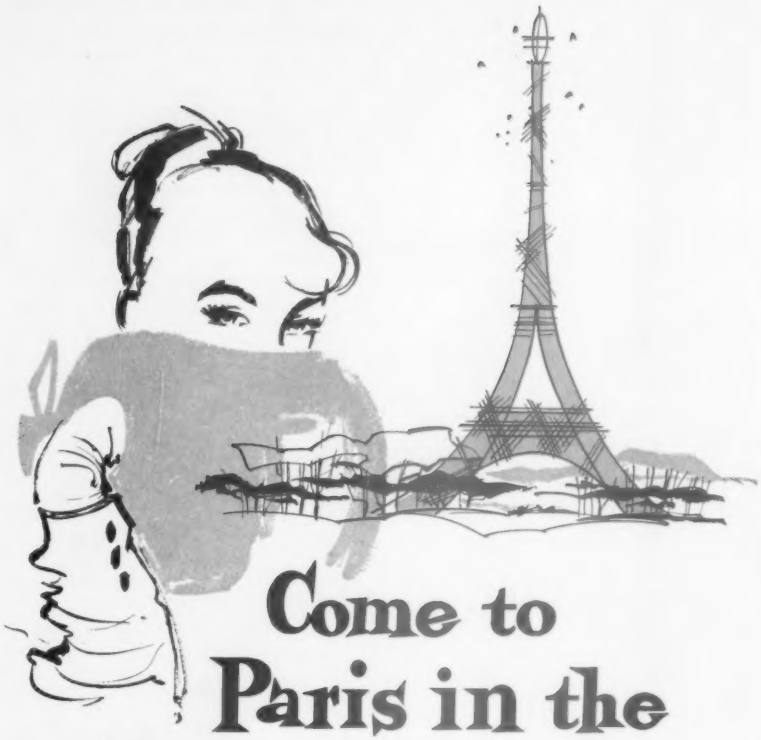

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Alaska may be getting big gas reserve

ALASKA'S KENAI peninsula may prove to be an important gas reserve, larger than originally believed, following the recent discoveries of Union Oil Co. of California and Ohio Oil Co., partners in a 55,000-acre block where the discovery well was drilled. Since completion of the first well, two more tests have been made.

The three wells were drilled by Coastal Drilling Co., Bakersfield, Calif., with personnel that went to Alaska a year ago. Coastal's Emsco GB800 rig was assembled in the contractor's Bakersfield yard.

The discovery was the Union-Ohio 14-6 and was completed October 11 with a total depth of 15,047 ft. It flowed dry gas at the rate of 31 M.M.c.f.d. through a 7/8-in. choke with tubing pressure of 1,650 psi. on test.

A second well drilled a mile north of the initial venture, flowed 17 M.M. c.f.d. of gas through a 3/4-in. choke with tubing pressure of 1,250 psi.

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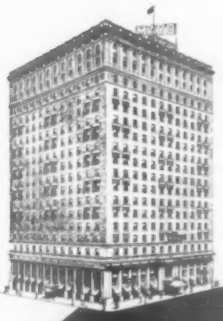

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This was the 34-31, located in SW SE 31-5n-11w.

The third test is still undergoing production tests and it is designated the 33-30 and spots over 2 miles north of the first well.

At a total depth of 15,047 ft., the initial well holds the depth record for Alaskan wells. The lower portion of the hole was abandoned after a fishing job and the well was completed with perforations at 4,720-4,894 ft. The third well has 7-in. casing cemented at 5,011 ft., total depth.

The three wells will provide initial requirements for gas to be delivered to Anchorage by the Anchorage Gas Corp. This distributing firm was recently granted a franchise to provide natural gas to the greater Anchorage area.

Further development of the gas field will depend upon gas volumes needed for the Anchorage markets. Presently, it is not known the areal extent of the gas reservoir nor the short-term or long-range requirements of present and future gas needs.

API to study model contracts

A MODEL CONTRACT committee has been organized by the API during its annual meeting in Chicago in November. The committee will be headed by F. H. Rhees, Sinclair Oil & Gas Co., Tulsa, and will undertake the development of a model rotary-drilling contract and a model bid-specification form.

Devising a reasonable contract will be an important step forward for the industry. It is considered that the committee work done under the auspices of the API will have wide acceptance due to the representation of major oil-company firms on this development. There will be some drilling-contractor members on the committee, but the project will not be a joint venture of the API and the American Association of Oilwell Drilling Contractors.

New depth record

A NEW NORTH DAKOTA depth record has been set by Amerada Petroleum Corp. with its 1-A Antelope Unit test in the Antelope field of McKenzie County. The well reached 15,211 ft., shattering the old depth record of 14,828 ft. Worley & Harrell, Inc., Tulsa is the contractor.

The hole is located C SE 1-152n-95w and is projected for the granite at 15,300 ft. At last report the venture was going still deeper.

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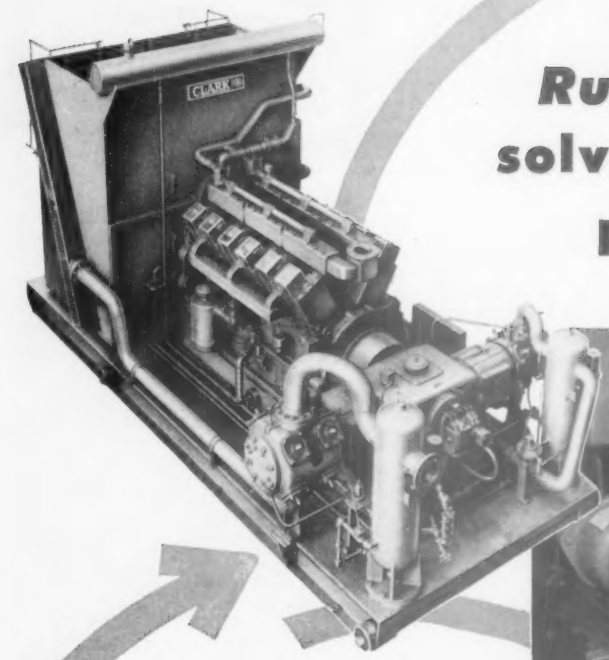
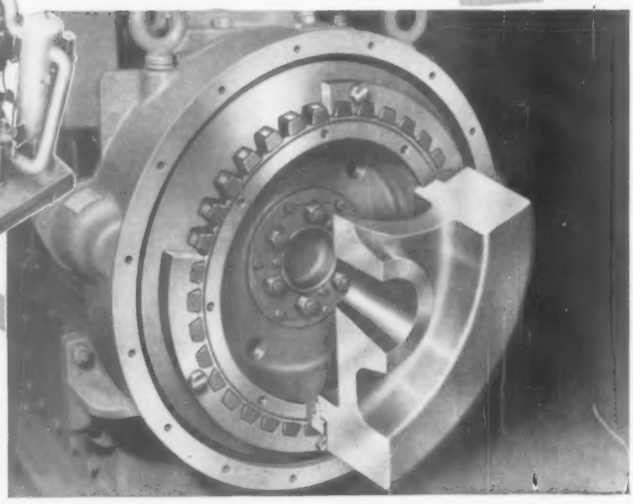
TWIN DISC *Rubber Block Drive* solves alignment problems . . .





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To connect the compressor to the engine, Clark uses Twin Disc Rubber Block Drive, a simple but highly effective coupling proved by over ten years of field service. The annular ring "gear" with rubber covered "teeth" is bolted to the compressor flywheel.

The Rubber Block Drive compensates for both angular and parallel misalignment and also cushions out shock loads. It operates without lubrication or attention of any kind. And elimination of drive belts and gears helps boost the compressor's mechanical efficiency as well.

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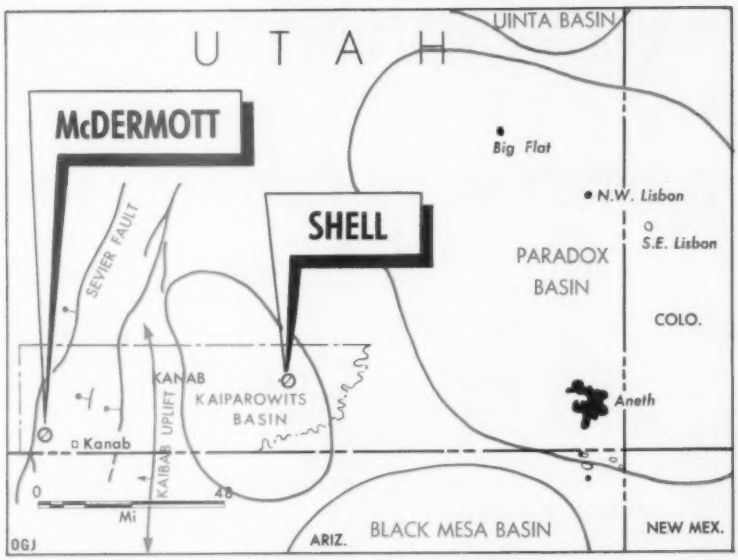


TWO OF THE MOST IMPORTANT wildcats now on the scout reports are Shell 1 Soda Unit and J. Ray McDermott 1 State, both in Kane County, Utah. If either one should hit, the exploration story of the year would be written in January.

Is 1960's big exploration story now being written?

Kaiparowits basin could well be its locale

BY FRANK J. GARDNER

LAST WEEK this column made mention of new names we might be running into during the new decade. Here's another: **Kaiparowits.**

The Kaiparowits region embraces all the western half of the map on this page. Its anchor is the Kaiparowits basin, a structurally simple and relatively small basin compared to its big brother, the Paradox to the east. To the west of the basin lies its structurally complex counterpart, the Kanab fault region; this area is dominated by three principal elements: the Kaibab uplift, the Paunsaugunt fault, and the Sevier fault.

Kane and Garfield counties, Utah, hold sway over most of this potential oil province, but the Arizona-Utah line cuts across its southern lobe, and a commercial oil strike anywhere within its borders could trigger a boom in either state. The Arizona "strip country" south of the border has long awaited a successful discovery.

A pair of wildcats . . . That strike may well be on the horizon. At least, two earnest efforts are being made. It's doubtful that there are two more significant wildcats now drilling anywhere else in the United States. Both are in Kane County. One lies in the basin, one in the fault complex.

Along the Sevier fault in southwestern Kane (Section 2-43s-8w), J. Ray McDermott & Co. 1 State is going down as a tight hole; as usual in such operations, rumors radiate by the dozen. Official scout reports say it has reached 9,000 ft. Less-official ones say it's below 11,000 ft. But right or wrong, the rash of rumors points to this as one of the most important tests in many moons for the Rocky Mountain region. It is said to have found potentially commercial oil or gas shows at 2,600 ft. (formation unidentified), 5,200 ft. in the Coconino-Permian, 9,200 ft. in the Mississippian, and 10,800 ft. in the top of the Devonian.

McDermott drilled two strat tests on this prospect in 1954; these were 1 Government-Strat (Section 19-42s-7w) and 2 Government-Strat (Section 17-42s-7w). Both stopped in the top Permian-Kaibab, with total depths 3,652 and 3,712 ft., respectively. Information from these two early holes is believed to have contributed to a subsurface picture that led to the staking of the current wildcat.

Original plans for McDermott 1 State called for an 11,000-ft. hole to test Cambrian-Tapeats. If, as rumor has it, the bit is now at 11,200 ft., and is still in Devonian, we shall probably see drilling extended to 12,000 ft.

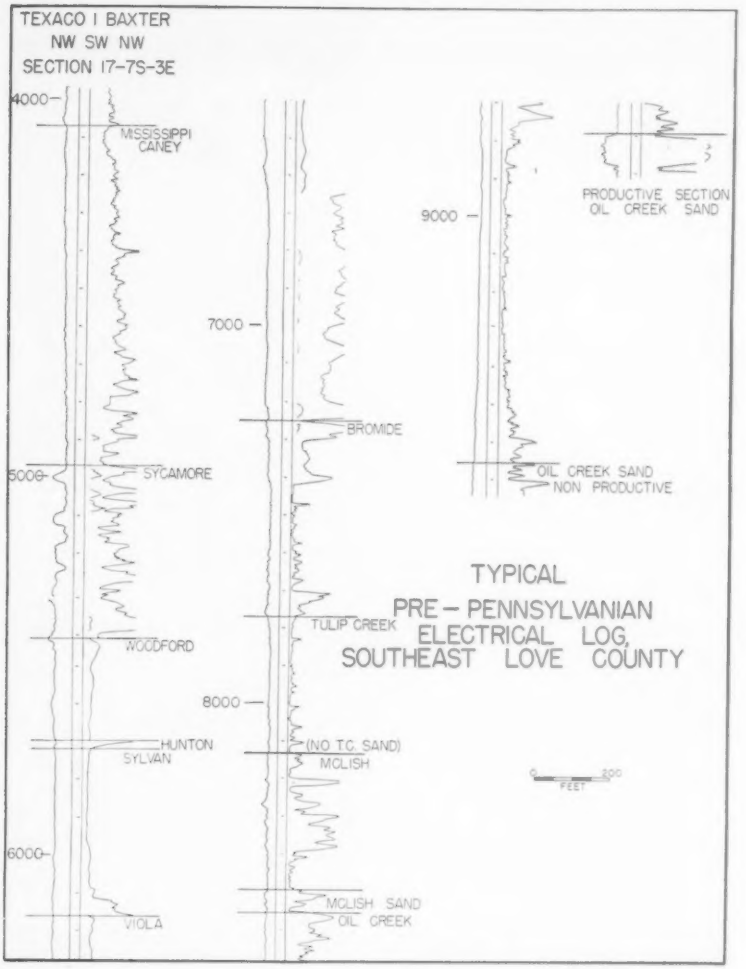
The other important wildcat in Kane County is Shell Oil Co. 1 Soda Unit, Section 2-40s-7e, in the eastern Kaiparowits basin. Shell has an enviable record of discovery of oil in strange new places, and when it tackles a remote basin like this, alert observers take heed. The 1 Soda Unit is now on its way down, with total depth below 5,700 ft.; it's a 7,100-ft. contract to test Pennsylvanian and Mississippian sands.

Subsurface data are sparse in the Kaiparowits country. But data from a dozen key wells that have been drilled indicate definite oil potential for this basin. The California Co. drilled three deep wildcats here, beginning in 1948. All three had very good shows of oil. The 1 John's Valley (Section 22-35s-2w, Garfield County) went to 10,335 ft. and had shows in Paradox-Pennsylvanian, Timpoweap-Permian, and Kaibab dolomite. The 1 Upper Valley (Section 12-36s-1e, Garfield County) swabbed 27° oil from the Permian at 6,041-6,302 ft. for 18 days before it was abandoned. The 1 Muley Creek (Section 18-36s-10e, Garfield County) had shows in a 70-ft. Permian sand section, with solid saturation at 3,940 ft., but it too was abandoned.

Could write a story . . . Both Shell and McDermott have good reason for invading the Kaiparowits region with these vitally important wildcats. For success at either one will blast wide open a brand-new theater of operations and thrust all of southern Utah into the hottest drilling campaign of 1960. It could well be that the exploration story of 1960 is now being penned at Kaiparowits.

PART 2—CONCLUSION

Oklahoma's Love County invites new exploration



IN THIS pre-Pennsylvanian section, the prolific Ordovician-Simpson group accounts for much of Oklahoma's production. So far in Love County, only the Bromide and Oil Creek of the Simpson have paid off. Fig. 4.

TABLE 2 — PRODUCTION FIGURES FOR LOVE COUNTY, OKLAHOMA

Field	Pay	Thickness (feet)	Production acreage	Cumulative production 1/1/59
Decherds Bend	Best sand	6	10	1,969
Southwest Enville	Sycamore	30	560	106,783
	Oil Creek sand	90		
	Bromide	18		
West Enville	Oil Creek sand	102		
Forbes	Deese	12	10	339
Greenville	Deese	43	120	145,954
North Greenville	Deese	16		94,183
Northeast Greenville	Dornick Hills	13		835,274
	Deese	25		
Northeast Leon	Deese	15	80	150,773
North Marietta	Viola	43	170	104,272
Northeast Marietta	Deese	32	40	27,088
Southeast Marietta	Oil Creek sand	72	160	
Northeast Oswalt	Deese	49	40	70,657
Overbrook	Springer	58	40	7,352
East Overbrook	Springer	17		
South Overbrook	Deese	24	320	287,713
Pike North	Deese	48	40	42,854
Sivell's Bend	Pennsylvanian	25	540	829,070
Stockton	Pennsylvanian	34	240	386,200
Thackerville	Deese	8	40	

LOVE COUNTY has very few oil fields when compared to surrounding counties and those existing exhibit a general unanimity of being small and unspectacular (Table 2). This, combined with only two regional structural features, makes it possible by examining only three fields to illustrate those geologic features which have influenced accumulation in the county.

Northeast Greenville field . . . Northeast Greenville field started with a small Deese (Tims sand) producer. Five years later, in 1954, the Britton 1 Vestal found Dornick Hills (Vestal-Hendon sand) production. In the next year, only 11 completions were recorded with a cumulative production of 23,943 bbl.; but from August 1955

BY C. C. REEVES, JR.
Texas Technological College,
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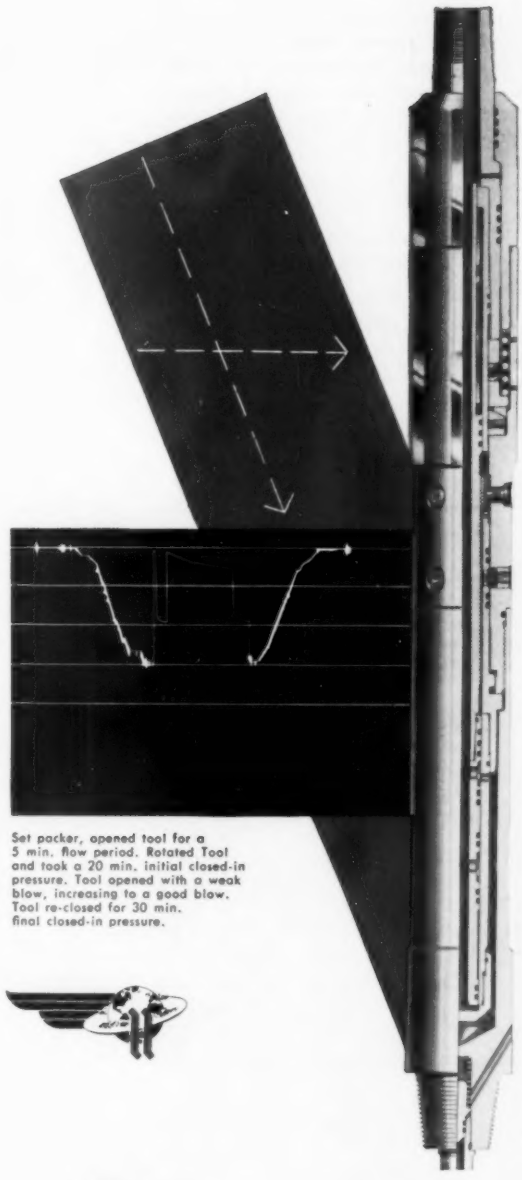
The design of the valve arrangement provides for closing in the formation for both initial and final CIP pressure periods and affords communication from the annulus to the drill pipe for reverse circulation after the test is completed. The Dual CIP Valve is assembled in the test string immediately above the Hydro-Spring Tester.

30 SECOND TECHNICAL DESCRIPTION

The tool incorporates a five-position sliding type valve—with spaced "O" rings moving past ports in the sleeve—actuated through a coarse left-hand thread mechanism by right-hand drill pipe rotation. The valve is locked against premature rotation by the jaw clutch held in place by the spring. The differential area of the design permits disengagement only when sufficient drill pipe weight is applied. Greater safety results, as the clutch is in the locked position while going in the hole.

After the desired interval for initial flow, the Dual Closed-In Pressure Valve is closed by rotation of the drill pipe 11 turns to the right for the initial closed-in pressure period. At the end of this initial period, the valve is opened by 14 additional turns to the right for the second flow interval of the test; then, at its conclusion, 14 more turns (right-hand rotation) again closes the valve for the final closed-in pressure interval after 16 additional right-hand turns.



Set packer, opened tool for a 5 min. flow period. Rotated Tool and took a 20 min. initial closed-in pressure. Tool opened with a weak blow, increasing to a good blow. Tool re-closed for 30 min. final closed-in pressure.

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LOVE COUNTY

to approximately August 1957, 48 wells—37 of them productive—were completed.

Since 1957, the Northeast Greenville area has continued as one of the hot spots of Love County. The productive area underwent rapid northwest expansion. Actually, there are three separate fields in the Greenville area but for the purposes of this report only Northeast Greenville is considered.

Four horizons have produced in the Greenville area. The Burk Royalty Co. 1 McKinney, 20-6s-2e, produces from a zone tentatively correlated by the author as Pennsylvanian lower Tussey "A." The Ward S. Merick 1 Webb, 20-6s-2e, was one of the earlier Pennsylvanian Tims sand producers.

An upper Dornick Hills sand which varies in thickness from 0 to 40 ft. (Fig. 6), is found just beneath the Dornick Hills unconformity. This sand exhibits sporadic porosity, most of which is located in the northwest part of the SE¼ of Section 20, with the exception of the Trice Production Co. 3 Hendon, 29-6s-2e, which produced 39 bbl. in 3½ hours.

The major producing horizon is the Pennsylvanian - Vestal - Hendon sand which usually lies 350-400 ft. beneath the Dornick Hills unconformity. The Vestal-Hendon varies from 0 to 55 ft. in thickness and has yielded up to 480 bbl. per day on tests. Sand limits seem well defined by faulting on the north and southwest and by the strand line on the east and southeast (Fig. 6). The northwestern sand limit was not defined when the author did the preliminary work on Greenville but is no doubt well contained within the graben-type structure.

It is interesting to note that at least one case of isolated Mississippian-Sycamore production. the Schermerhorn Oil Corp. 1 Perry, 21-6s-2e, occurs within field limits.

A normal stratigraphic section is present and correlation to the Brock field area some 8-10 miles to the northwest is almost "laydown." Surface material is Cretaceous which is unconformably underlain by as much as 1,900 ft. of Pennsylvanian-Hoxbar. Beneath the Hoxbar is over 3,000 ft. of Deese which rests on 1,100 ft. of Dornick Hills. The normal Paleozoic section has been found in nearby deeper wells.

Northeast Greenville aptly illustrates the type of trap associated with an anticlinal trend which has undergone secondary deformation. The trap is basically structural but stratigraphic principles apply. Distribution is also altered by faulting.

The Vestal-Hendon sand production is controlled by faulting and pinchout of the sand, Tims sand production by pinchout of the sand, and probably by faulting updip and to the northwest.

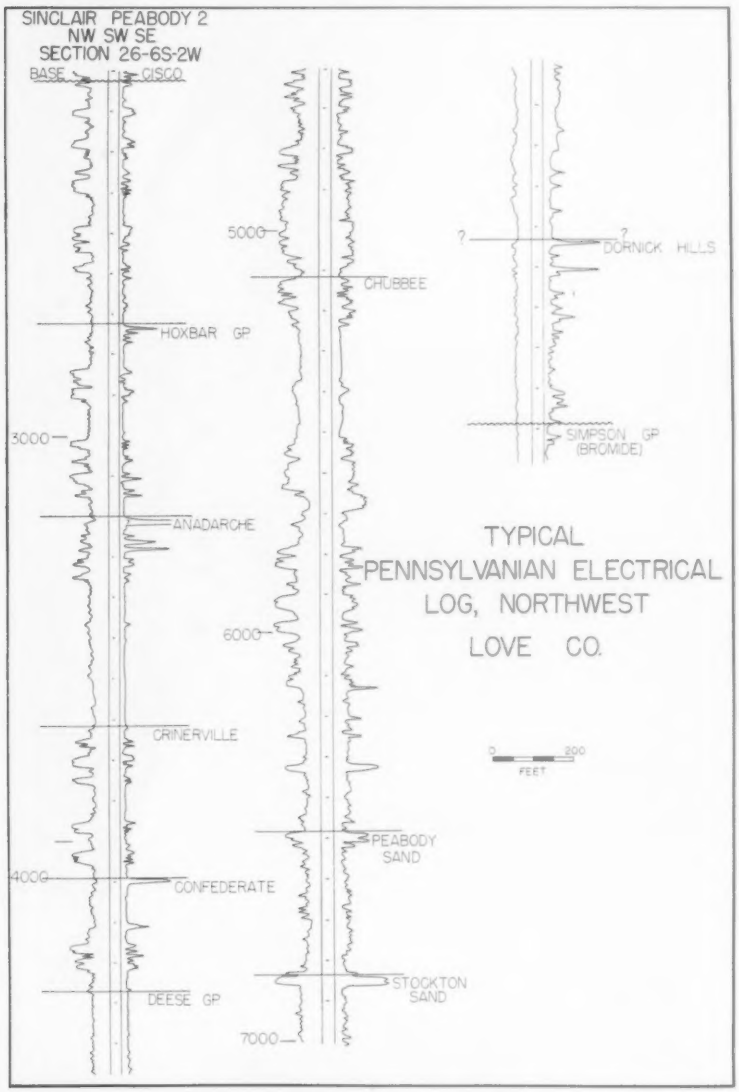
These conditions persist along the Criner Hills trend as has been, and is still being proved, both to the northwest and southeast of the Greenville area.

Northeast Greenville is within a downdropped block, open to the southeast but closed to the northwest by fault junction. The production of gas by Sohio B-1 Tims, 29-6s-2e, from the same horizon which produces 35° oil in a structurally higher well (Trice 6 Hendon, 29-6s-2e) is suggestive of fault control.

The northern fault is placed by the Samedan Oil Corp. 1 Smith Estates' failure to produce from Vestal-Hendon sand and because of the structurally high position of Neustadt Bros. 1 Knight, 17-6s-2e.

This graben is open to the southwest for the post-Dornick Hills strata since the fault apparently terminates at the Dornick Hills unconformity. This is fortunate since it has allowed accumulation-production of the Deese to extend to the northwest.

Production figures for Northeast Greenville are found in Table 2.



THE PENNSYLVANIAN log-section shows good sand development which is not always easy to predict. As much as 3,000 ft. of total Deese occurs in some locales. Fig. 5.

Southwest Enville field . . . Southwest Enville field was discovered by the

saved: $500 per day in Oklahoma's deepest well

At a depth of 24,002 ft., Shell Oil Company's Rumberger #5 in Elk City Field, Oklahoma, is the deepest well in Oklahoma and the second deepest well in the world. During drilling it was decided to change to an oil base drilling fluid when high temperature gelation of the lime-base emulsion mud was causing too much trouble.
The interval between 20,120 ft. and 24,002 ft. was drilled with *Black Magic Supermix*. In addition to greatly reducing mud problems due to high temperature (as high as 360°F), improving hole stability and retaining the accuracy of log interpretations – the use of Black Magic considerably reduced mud costs. The following is from a report published in Oil & Gas Journal, September 7, 1959*:

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"Total net cost for the oil base mud system on this job amounted to $40,000 or about $285 per day, or $10.30 per foot drilled. Compare this mud cost with the maintenance for the 13.5 lb. per gal. lime-base mud used over the 140-day period prior to changing to oil base mud. It amounted to approx. $110,000, or about $785 per day or $19.50 per foot drilled. Thus this specific oil-base-mud system saved $70,000 or $500 per day, assuming maintenance costs for the lime-base mud would have remained the same had it remained in use."

Of the seven deepest wells in the world (drilled beyond 20,000 ft.), Black Magic was used to drill three of them. *The mud cost in each of the Black Magic wells was considerably less than any of the other four drilled with water-base mud.*

* *"Oil Base Mud Passed Test in Deep, Hot Hole," by Jack MacEachern and Al Seaman. Copies will gladly be mailed on request.*

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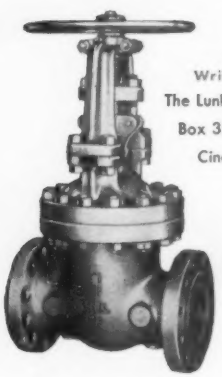

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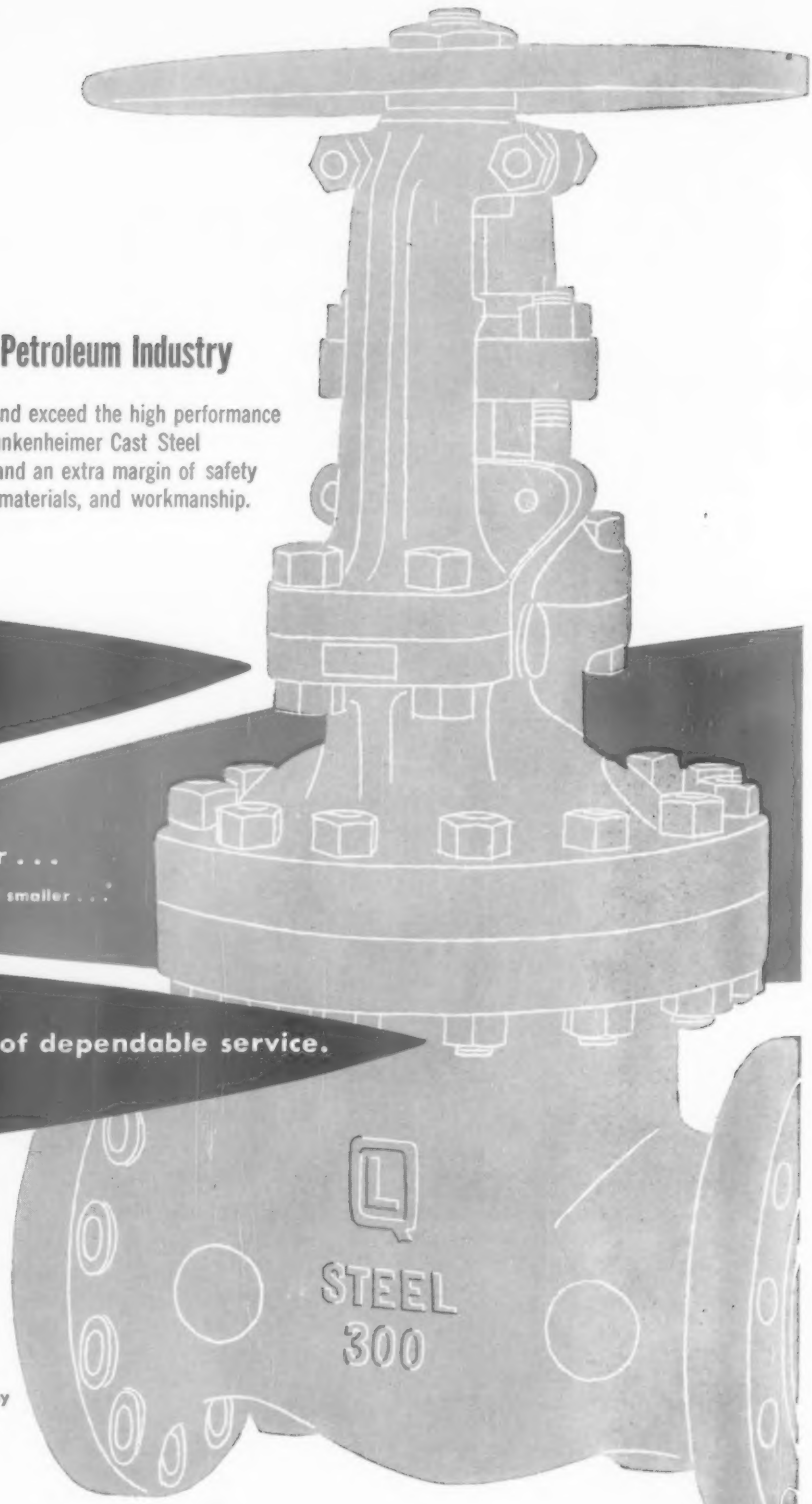

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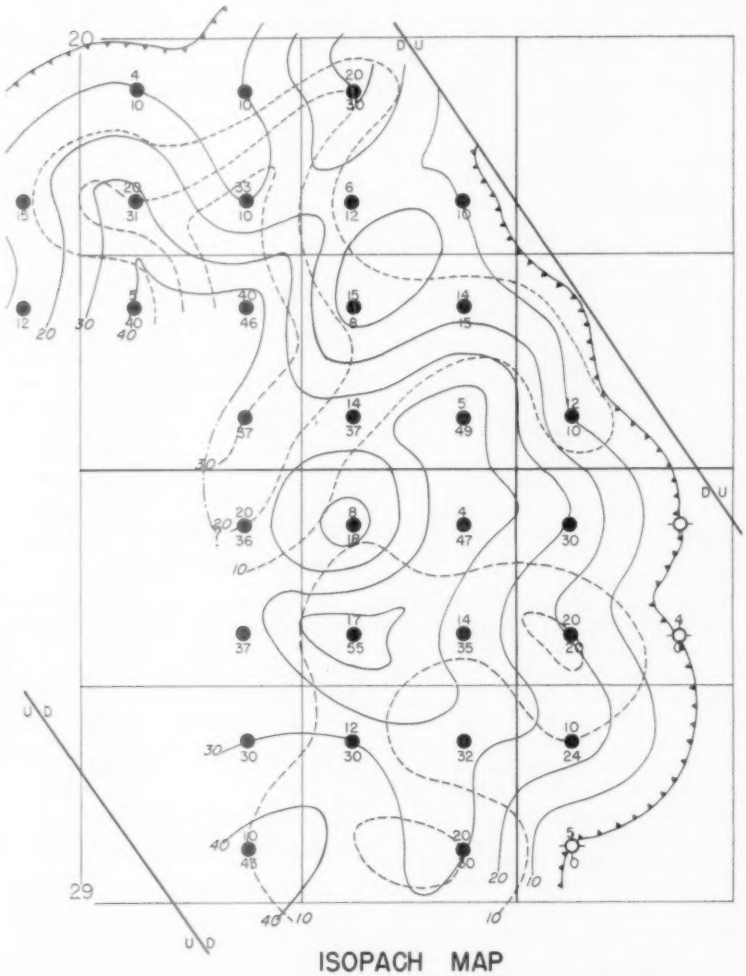
attempt of Texaco to find the basal Ordovician-Oil Creek sand strand line. The basal Oil Creek sand produces to the south in Grayson County, Texas, and outcrops to the north in the Arbuckle Mountains, hence its strand line must pass through southeastern Love County.

The Southwest Enville area is directly over the southeastward-plunging Criner Hills trend which is covered in southeastern Love County by Cretaceous overlap.

Southwest Enville structure was drilled as early as 1945 by Magnolia Petroleum Co. 1 Stewart, 7-7s-3e, but the Stewart was too high on structure for the shallow Sycamore production (Sycamore eroded) and not deep enough to test basal Oil Creek pay.

The structure was then unsuccessfully drilled by Texaco 1 Conrad, 17-7s-2e, in 1953. The Conrad was also too shallow to test basal Oil Creek but did find Sycamore which was structurally low and dry. The discovery well, Texaco 1 Westheimer, 17-7s-3e, was located little more than 1,400 ft. from the old Conrad location in the late summer of 1956; the Westheimer blew in during the early spring of 1957.

The major pay zone at Southwest Enville is the basal Oil Creek sand, producing by solution gas drive. The high pressures, gas-oil ratio usually in the neighborhood of 12,000:1,



ISOPACHOUS RELATIONSHIPS between upper Dornick Hills and Vestal-Hendon sands are mapped. Both these Pennsylvanian beds are oil-bearing here. Fig. 6.

LOVE COUNTY

caused numerous drilling and completion difficulties.

Several minor zones also produce, the Sycamore being the most important. Sycamore production is confined to the structural high and is usually by pump.

The Ordovician-Bromide sand zone was found productive in one well and good shows have been recorded in the Hunton, and Ordovician-McLish sections in several wells.

Southwest Enville structure was originally thought to be a simple, large anticline with probable simple faulting.

Preliminary work on Southwest Enville showed a large primary anticlinal structure which had been disected by large northwest - southeast trending thrusts. Several normal faults were apparent. Work in progress by the author now seems to indicate overturning of the primary structure to the southwest, though evidence for such a structure is not readily apparent in the majority of wells.

Overturning of what is thought to be the same structural trend to the northwest and the west (Frankfort 1 Conrad, 34-6s-2e, and the Walter Gant 1 Sadler, 13-7s-2e) and near overturning of the Handy structure to the southeast lends support to this new interpretation.

Since the Southwest Enville structure is on trend with the Criner Hills it is of considerable importance to decide which of the three structural trends Southwest Enville represents. If Enville is a continuation of the Rock Crossing anticline, then perhaps a continuation of the Criner anticline lies to the southwest though this seems highly unlikely from the present structural picture. This reasoning might also place a structural trend northeast of the Enville high which would then be correlative to the Overbrook anticline of the Criner Hills area. Drilling in the area surrounding Southwest Enville has shown the presence of reservoirs both to the northeast and south, but their correlation to Criner Hills structural trends is highly conjectural.

After discovery of Southwest Enville the southeastern part of Love County became a small boom area, with resultant discoveries in almost all directions.

To the north Sinclair 1 Tucker, 32-6s-3e, flowed 4 M.M.c.f.d. of gas plus 389 bbl. of distillate in 24 hours. The Sun Oil Co. 1 Brahma, 35-6s-2e, flowed 13 bbl. of oil per day.

To the northeast, the Pasotex Petroleum Co. 3 Brannon, 3-7s-3e, flowed 20 M.M.c.f.d. of gas with 90

bbl. of distillate per million. The Pasotex 1 Brannon, 24-7s-2e, brought in production to the southwest.

Stockton field . . . The Stockton field, first commercial producer of Love County, has always given hope to Marietta syncline production aspirants. Production, which is from the Witt and Stockton sands of Pennsylvanian age (Fig. 5) varies from 6 to 25 bbl. per well per day.

Several wells have been drilled into the underlying pre-Pennsylvanian but no production has been found, even though good structure closure exists. Sinclair 1 Stockton, pool opener in 1936, acidized the "Birdseye" limestone of the Oil Creek formation, and initially made 302 bbl. of 36° oil. This very encouraging show soon decreased to 47½ bbl. swabbing, then the well was plugged back to the now-producing Pennsylvanian sands.

The Stockton field exhibits some of the finest trap and the poorest reservoir probabilities of the entire Marietta synclinal province. Located on the one anticlinal trend that has been found (to date) in the syncline, Stockton well exhibits the geologic history of the province.

Pre-Pennsylvanian structure is anticlinal with approximately 1,500 ft. of closure to the top of the Cambro-Ordovician-Arbuckle. The Viola, Bromide, and probably Hunton carbonate sections exhibit closure in the surrounding area but have shown poor commercial possibilities, not because of the absence of oil, but because of low porosities and permeabilities.

Pennsylvanian strata also show closure over the old pre-Pennsylvanian high indicating rejuvenation of the underlying structures, probably during the Virgilian-Arbuckle orogeny. Closure is slight, only 300 ft.

Relief of this anticlinal trend varies at the particular position on the flank, but approximates 1,000 ft. in the Stockton-Pike North areas. This, however, had not influenced the Dornick Hills conglomerate limestones and consequently no onlap can be expected.

The Stockton area typifies the drilling history of the Marietta syncline. When good porosities and permeabilities are found, as in the Pennsylvanian section, a lack of closure prevents large accumulations. Conversely, when good structures are found as in the pre-Pennsylvanian section, which are obviously saturated, poor permeability delegates them as noncommercial.

Future Prospects

The probability of Love County becoming an important oil producer certainly exists, simply because of the presence of regional structures, multiple periods of deformation, and consequent major unconformities.

The Marietta syncline, with innumerable onlapping Pennsylvanian sands is most inviting, not only along its northern flank, but along the southern flank in Cooke County, Texas. The possibility of production from these sands was reviewed in a previous investigation by the author.

The pre-Pennsylvanian section of the Marietta syncline has been a tempting but elusive prospect since 1936 when the teasing Viola production of the Westheimer-Daube well was found. There is certainly a lack of pre-Pennsylvanian structure within the syncline, though recent drilling is indicative of additional fault zones.

Presence of the pre-Atokan unconformity in the Marietta syncline has produced a regional stratigraphic trap condition for the truncated pre-Pennsylvanian carbonates. Though these carbonates are generally poor prospects because of low initial porosity and permeabilities, they easily develop secondary porosities by solution, fracturing, or dolomitization. Since pre-Pennsylvanian faulting is known in the syncline and more undoubtedly exists, it is quite likely that suitable porosities-permeabilities also are present.

The discovery of good pre-Pennsylvanian structural traps within the Marietta syncline has been considered highly unlikely for many years, hence the hands-off policy of the major firms. However, as the search swings toward stratigraphic prospects, the Marietta syncline can be expected to assume a more important role. The presence of pre-Pennsylvanian oil in the province was proved long ago; and it is felt that industry should abolish the old "structural-trap" school of thought and concentrate on the adaptation of these exploratory methods previously considered academic—sedimentary analyses, rates of onlap, offlap, and strike overlap.

Of most recent interest is the strandline position of basal Oil Creek sand which was found productive at Southwest Enville. The strand line has been placed by some geologists, on the basis of a post-Joins emergence, just east of the Criner Hills. Its position south of the Criner Hills and north of Red River is still conjectural. With the presence of nearly 100 ft. of sand at Southwest Enville, it is obvious that it must continue west for some distance.

The Criner trend, with its multiple structural lineations, should give southeastern Love County its own Golden Trend. Present leasing, drilling, and completions lend support to this statement.

Present areas of drilling activity in Love County are centered along the Criner trend at Overbrook, Greenville, and around the Southwest Enville area, though scattered wildcats are found in several other locations.

As usual the Marietta syncline holds speculative interest. Sections 24, 25, and 26-6s-1e, which lie southwest of Greenville and close to the old Viola production of the Westheimer-Daube well, are now tightly leased by independents and two major companies. Sections 6, 7, 9, 16, 17, and 21-6s-1w, are also undergoing heavy leasing. This area lies west of the Oswalt field and northeast of Stockton.

Viola is new Oklahoma producer

The Viola lime is a new pay in Oklahoma's North Buffalo field, one of the most active areas in the Anadarko basin region. The discovery well is Sinclair Oil & Gas Co. 1 Shupe, C SW SW 5-28n-22w. The well flowed 100 bbl. of oil in 10 hours through ¼-in. choke from the Viola at 7,252-56 ft. It also produced from Lansing and Arbuckle, regular field pays.

Gas flows at Hugoton deep test

Lower Keyes Pennsylvanian gas is reported at Shell Oil Co. 1-20 Fisher, a deep wildcat inside Hugoton field, Texas County, Oklahoma Panhandle.

The well flowed 1,261 M.c.f.d. at 6,606-18 ft. on ½-in. choke. Later, it made 1,456 M.c.f.d. on 1-in. opening.

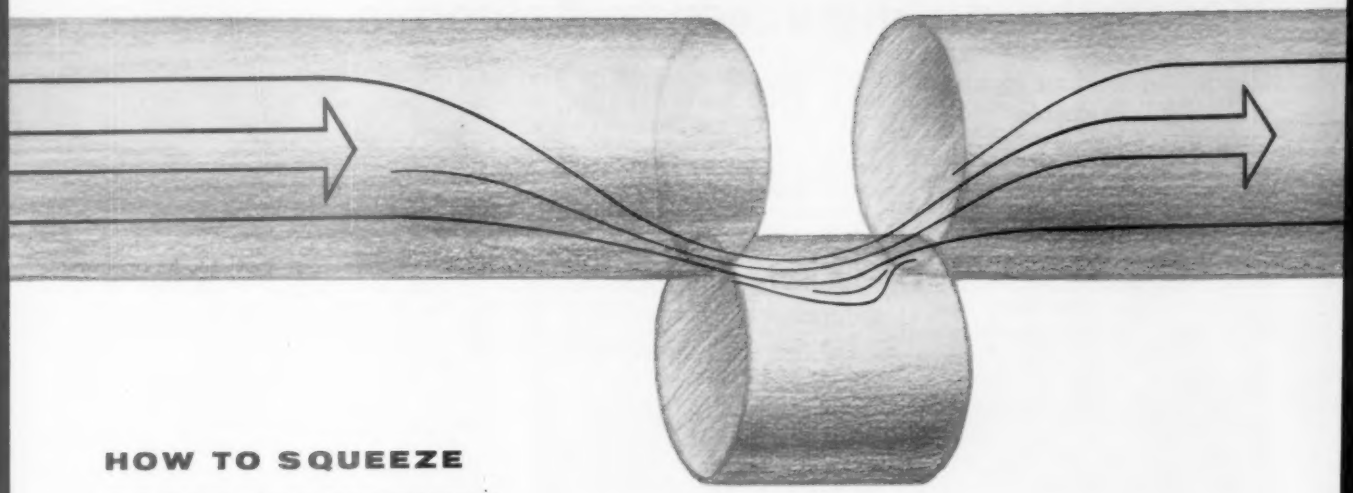
Bartlesville pays at new Wewoka well

A Bartlesville sand producer is reported in Wewoka district, Seminole County, Oklahoma. The well is Kirkpatrick Oil Co. 1 Haning in NE NE NW 2-7n-7e. It flowed 120 bbl. of oil per day on 20/64-in. choke from perforations at 2,958-68 and 3,118-26 ft. Bartlesville is Pennsylvanian.

Kingfisher County well is dual-pay discovery

Oklahoma's Kingfisher County has a dual-zone discovery at King-Stevenson Oil Co. and Calvert Drilling Co. 1 Grimes in C NW SW 32-19n-6w. Production is in the Manning and in the Red Fork.

The Manning zone got 17 bbl. of oil per hour from 6,792-6,832 ft. on 18/64-in. choke. The Red Fork Pennsylvanian at 6,626-42 ft. flowed 1 M.M.c.f.d. on ¼-in. choke. This new field lies between North Dover and East Hennessey fields.



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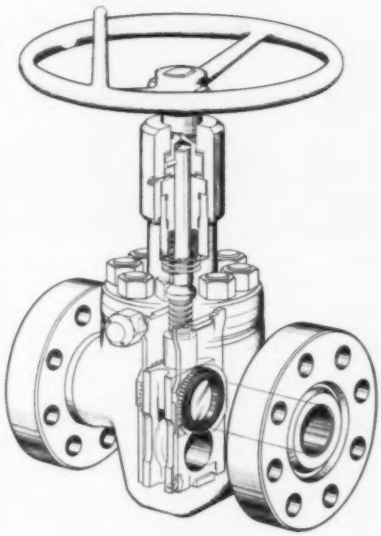

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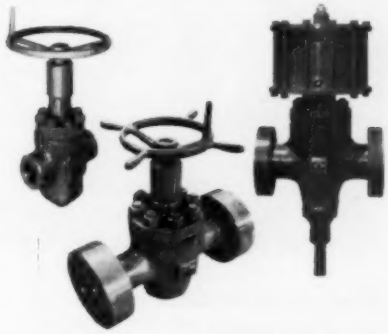

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Here's the drilling action in California . . .

Interesting wildcat locations staked in California

The year end saw a number of interesting wildcat locations staked in remote areas of California. Among the more interesting were these:

. . . Santa Barbara County. Belco Petroleum Corp. announced a site 500 ft. onshore from the Pacific Ocean in the region of Point Conception and near several old dry holes. The location, SW SE 5n-33w, is adjacent to the offshore parcels currently being core drilled.

. . . Los Angeles County. COMCO of Bakersfield will drill a wildcat 6 miles southwest of the Mojave Desert town of Lancaster 70 miles north of Los Angeles. The drill site is about 1 mile west of a 4,112-ft. test which has been standing suspended since June 1948.

. . . Butte County. Western Gulf Oil Co. staked a site for a gas wildcat in northern California's Butte County about 16 miles southeast of the South Dome gas field. When under way, this test will rank as the state's most northerly active drilling project. The drill site is only about 100 ft. north of a 5,320-ft. wildcat abandoned in 1944 by Richfield Oil Corp. Western Gulf's test will be a shallow 1,800-ft. effort.

Another gas discovery for California

Colusa County's mildly booming Arbuckle gas field yielded a probable new field discovery in a Western Gulf Oil Co. wildcat 6 miles southeast of the nearest producer. The Western Gulf well reportedly flowed at a 2,900-M.c.f.d. rate through a ⅜-in. choke on a 7-hour formation test of perforations between 8,468-87 ft. Total depth of the wildcat in NE NE 14-13n-1w, was 8,971 ft.

In the main area of the field, Occidental Petroleum Corp. was continuing its aggressive drilling program on its holdings with one well drilling, two recently completed and awaiting a pipeline connection, and a location staked.

McKittrick extended in California Kern

Production in Kern County's McKittrick field was extended ¾ mile east of the nearest producer on the east flank of the field. Standard Oil Co. of California found the gas zone in the shallow sand at 965 ft. This field ranks as one of the state's oldest, dating its discovery back to 1887. The new Standard well, 8-5 17Z, was completed flowing 310 M.c.f.d. through a 20/64-in. choke.

Fillmore Spaulding zone extended by Standard

The deep Fillmore field in Ventura County, California, was extended almost ⅔ mile northeast by a 14,868-ft. well in SE NE 19-4n-19w. Standard perforated in the Pliocene Spaulding zone between 14,712-71 ft. and completed the well flowing 395 bbl. daily of 32.6°-gravity crude through a 15/64-in. choke.

Southeast Jasmin stepout appears successful

A wildcat drilled by Ned Barmore about 2 miles southeast of the nearest Jasmin field well in Kern County, California, was completed as a probable new discovery. The well was put on the pump making 50 bbl. daily from 52 ft. of perforations above 1,862 ft.

New field discovery for California's Monterey

A new field discovery in the Rancho San Bernabe area of Monterey County was scored by a Richard R. Thorup wildcat about 18 miles north of the big San Ardo field. The Thorup test was completed in an interval at 2,009-2,130 ft. making 115 bbl. daily of 15% cut crude. The operator was completing the first offset located several locations south of the discovery.

California desert wildcat abandoned

The latest effort to find production in California's vast desert regions failed when Comco, operator, abandoned a 2,500-ft. test 6 miles southwest of the upper Mojave Desert community of Lancaster.

. . . and in Northwest Canada

BARRING any currently unforeseen difficulties there should be six extremely important exploratory wells drilling in Canada's Northwest Territories soon.

Six drillers in this vast expanse of wilderness can do little to prove up the region's true oil and gas-producing potential, but further success at any one of the wells will have tremendous bearing on the area's rate of exploration in subsequent years. Further encouragement for one of the present drillers has already recorded oil and gas discovery and more of the same will enhance its commercial worth.

Chance . . . The discovery well at Eagle Plains, Western Minerals et al. 1 Chance, situated at Lat. 66° 7′ 42″ N. and Long. 137° 31′ 42″ W., is about 200 miles south of the Mackenzie River Delta, 320 miles west-northwest of Norman Wells oil field, and 450 miles east-northeast of the Pacific Coast. This venture came up with oil and gas in the Mississippian in August of 1959 and was suspended following preliminary tests. The well had not reached projected total depth but was shut in due to lack of supplies. Equipment for men and machines has now apparently been delivered to well site and drilling is now proceeding below the discovery depth, about 4,250 ft. This test is being put down by Western Minerals, Ltd., Peel Plateau Exploration, and Conwest Exploration, Ltd.

Grandview Hills . . . The second well that should be making hole very shortly, if it is not already, is the Richfield & Associates Grandview Hills wildcat situated within the Arctic Circle. This far northern test, situated 18 miles west of the Mackenzie River, 150 miles northwest of Norman wells oil-producing area and some 200 miles northeast of the 1 Chance strike, was scheduled to spud early in December but an extreme cold snap held up spudding in. Frigid temperatures moved in on the Bawden Drilling, Ltd., crew and the metal of derrick and equipment became just about as brittle as glass and had to be handled with extreme care. Latest report from this location had equipment ready to start making hole about Christmas Day. This deep test that was originally scheduled by a group of Canadian independents headed by Scurry-Rainbow Oil, Ltd., is now being put

down by Richfield Oil Corp. of California and its partners, French Petroleum Co. of Canada, Hudson's Bay Oil & Gas Co., Canadian Devonian Petroleums, Ltd., and Clark Refining Co., as well as other undisclosed participants. Scurry-Rainbow, Morrow Properties, Paddon Hughes Development, and Clearmonte Holdings came out of the deal with a carried interest and a cash consideration.

New tests . . . Two more of the highly important wildcats will be operated by Home Oil Co., Ltd. These tests are in the Celibeta Lake district just 25 to 30 miles north of the Petitot River gas find in far northern British Columbia. These wells will be drilled by Home, Signal Oil of California, Kern County Land, Alminex, and United Oils on land acquired under farmout agreement from Canada Southern Petroleums. The farmout deal involved one of the largest land spreads and cash-bonus offers in Canadian oil history. For a cash consideration of $3,500,000, Home and its partners acquired exploration rights on a spread of 1,200,000 acres in the Territories. Canada Southern and its partners retained a 37½% carried interest in the project. In addition to the cash bonus, Home and associates are committed to spend $3,000,000 on exploring the lands. The pair of Celibeta Lake well sites are the first two tests in the project. This drilling is of special significance since these are the first wells on the largest structure known to have been mapped by seismic methods in the sedimentary basin of western Canada, east of the mountains. The drill bit will now tell what advance exploration has indicated.

The two final drillers in the present activity will be drilled by Imperial Oil Ltd., and Triad Oil Co., Ltd., as part of a large-scale program planned for this drilling season. The team hopes to complete five tests using two drilling rigs that will be operated by Wardean Drilling, Ltd., of Calgary. Only one well site has been announced by Imperial but two rigs were on the move at mid-December and drilling operations were to begin on a pair of wells by January 5. First location announced, Imperial-Triad P-2 Davison Creek, situated at Lat. 62° 11′ 41″ N. and Long. 118° 15′ 11″ W., is about 61 miles northwest of Fort Providence settlement, 155 miles north of the Alberta-N.W.T. boundary, at a point 9 miles west of the Sixth Meridian. The drilling team holds 47 permits in the general region and this initial test is on one of its 59,640-acre spreads.

Other Northwest Territories drilling projects yet to be announced will re-

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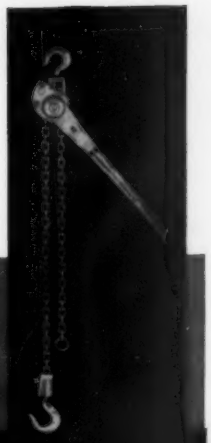

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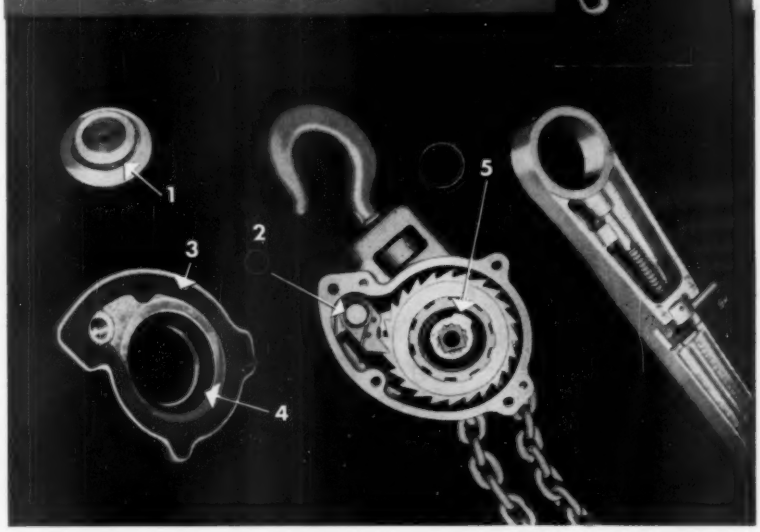

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The Safety Pull Hoist is easy to operate. The handle pull to lift rated load requires minimum effort. Load spotting is precise to within a fraction of an inch. Up and down controls are away from operator's hand so he can use shorter leverage for greater speed with light loads. Ball bearing swivel load hook and plated chain are additional features.

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sult in record activity in the Territories this winter.

Illinois leads basin drilling in tristate area

Illinois-basin developments included new discoveries in Coles, Franklin, Wayne, Jasper, and Christian counties, Illinois.

In Coles County, 2 miles north of Mattoon, Development Associates Inc. is testing the Rosiclare sand at 1,902-12 ft. at a 2-mile wildcat, the 1 Wm. H. Tracy, NE NW NE 27-13n-7e. A drill-stem test at 1,894-1,920 ft. flowed oil in 66 minutes. The second test is already under way nearby.

In Franklin County, Shell Oil Co. has a well going at 19 CW&F Coal Co., Tract RS, SW cor. NW 36-6s-2e. This well is a deep wildcat 1 mile south of Benton. A test of the Trenton Ordovician lime at 6,105 ft. had no showings, however. Log is being run.

The H. H. Weinert Estate has a wildcat 3 miles west of Fairfield in Wayne County. The 10 Lydia O. McPherson, C SW NW 3-2s-7e, tested the Devonian at 5,148 ft. This is also a deep wildcat.

In Jasper County, 2 miles southwest of Saint Marie, Bell Brothers completed 2 Charlotte Rudd in SW SW NE 2-5n-10e, ½ mile from production. The well made 118 bbl. of oil and no water, pumping and flowing from McClosky lime at 2,866-71 ft. through choke.

In Christian County, 3 miles southeast of Mount Auburn, H. F. Robinson 1 John T. Gibson, NW NW SW 28-15n-1w, made 40 bbl. of oil per day and 35 bbl. water. Pay is in Silurian at 1,931-45 ft.

Arkoma basin reference book now available

An important addition to the sparse literature of the McAlester-Arkansas Valley basin is now available from Ira Rinehart's Oil News Co. The book is entitled "McAlester-Arkansas Valley Basin." It contains historical well data on 130 oil and gas fields, and a forecast of future prospects in the basin which comprises 19 counties of eastern Oklahoma and western Arkansas.

This reference book is offered as the first comprehensive presentation of the area's historical background and provocative future prospects. The basin, called Arkoma by many, is on the threshold of a new era of exploration and development. All signs point to it as being a future gas giant for the nation.

Rinehart's book is well illustrated with maps, charts, and pertinent data. It is a welcome addition to geologic libraries. Books may be ordered from Box 1208, Dallas 21.

Marmaton discovery looms in Cheyenne, Kansas area

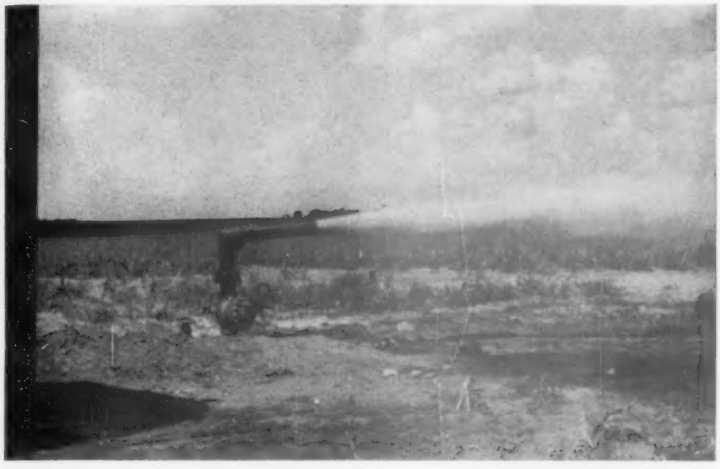
Another Pennsylvanian discovery for the Kan-Neb basin in northwestern Kansas is Saffa & Braur 1 Weaber in C SE SW 13-4s-38w, Cheyenne County. The well got 24 bbl. per hour on swab tests from perforations in the Marmaton at 4,765-70 ft.

Location is 11 miles northwest of Llanos field and 8 miles east of nearest drilling.

Offset fails at new Denver Basin field

The offset well to a new Dakota "J" sand field in Banner County, western Nebraska, failed. Pure Oil Co. 1 Brauer "C" in SW NE 34-18n-57w, was dry in the "J" sand at 6,870-6,914 ft. This well offset the discovery well to the southeast.

Pure Oil Co. completed the 1 Brauer "A" in C NE NW 34-18n-57w as a "J" sand discovery at 6,893-97 ft. The discovery pumped 180 bbl. of oil per day.



MAGNESIUM ANODES USED TO STOP CASING CORROSION IN 100 GAS WELLS

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Elsewhere in Nebraska, Chandler & Simpson confirmed "D" sand oil at Panam field in Banner County. The 2 Mossburg in C NW NW 20-17n-55w pumped 528 bbl. of oil per day from perforations at 6,264-77 ft. It is the west offset to the 1 Mossburg discovery in C NE NW 20-17n-55w, which made 476 bbl. of oil per day to open Panam field's "D" sand production.

Two Dakota fields open in Nebraska

Two Denver basin Dakota Cretaceous fields were opened in western Nebraska last week. In Banner County, D. J. Pickrell completed 1-24 Olsen in C SW SE 24-19n-57w for 165 bbl. of oil daily on pump from "D" sand perforations at 6,126-27 and 6,128-33 ft. This new pool opener is about 3 miles northwest of Cross field.

Nebraska drillers opened a new pool in Kimball County, 1½ miles east of Hoskovec field. The 1 Cornils, C SW SE 33-14n-57w, pumped 161 bbl. per day from "J" sand at 6,975-76½ ft.

Utah well nears completion

In Utah, Sunray Mid-Continent Oil Co. is preparing to run production string at the 1 Utah Federal "B," a 3-mile semiwildcat stepout located on a 46,000-acre block in Grand County.

On a 3-hour test, the well flowed an estimated rate of 5,181 M.c.f.d. through ¾-in. choke from the Dakota sandstone testing a drilling break interval from 7,254-70 ft. Tubing pressure gaged 360 psi.

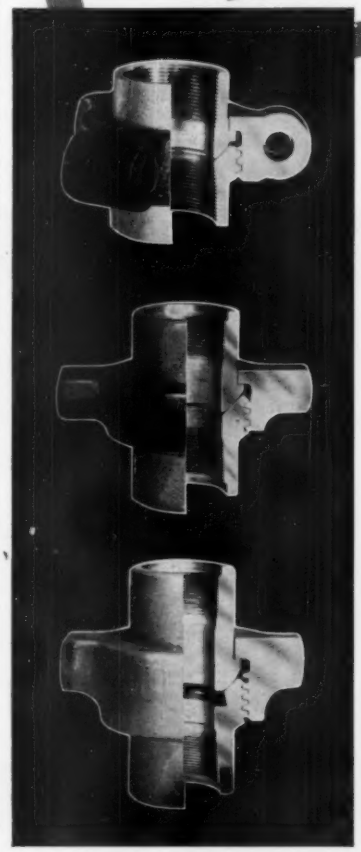
The well, located SW NE NE 23-17s-22e, was drilled on the large block which is 3 miles west of Westwater multiple-pay gas field.

Proposals have already been made for construction of a pipeline to the Westwater field connecting with a major trunk line.

Bromide being tested at Oklahoma well

Oklahoma's Canadian County in the central part of the state is one of the busiest new areas in Oklahoma. Cities Service Oil Co. 1 Porter-B, C NE SW 5-12n-8w, west of El Reno, has already found production in the Bromide and McLish Ordovician sands. The Bromide gave 3 M.M.c.f.d. at 12,344-75 ft. on a 4-hour test through ½-in. choke; the choke was cut to ¼-in., making 2,500 M.c.f.d. on 1-hour test.

Perforations in the Bromide and McLish earlier made 2,380 M.c.f.d. on ¼-in. choke from perforations at 12,625-12,744 ft.



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Montana well opens Tyler production

Tyler sand production was opened last week at a wildcat in Rosebud County, Montana. The discovery well is Vaughey & Vaughey 1 Kincheloe in C NW SW 35-11n-32e, south of production at the southeast end of Northwest Sumatra field.

The well pumped 145 bbl. per day from perforations in the Tyler sand at 4,957-65 ft.

First Abo opened at Artesia

ABO REEF strikes were completed this week in two widely separated areas of Lea and Eddy counties.

Carper Drilling Co. and Kewanee Oil Co. 1-A-MA Carper, ½ mile south and west of shallow production in Maljamar, East field, was completed for a calculated daily flowing potential of 282 bbl. of 36° oil. The potential was based on an 8-hour flow test through ½-in. choke, from perforations at 8,582-8,752 ft. Later, a 24-hour flow test through 20/64-in. choke tanked 270.5 bbl. of oil. Location is in 31-17s-33e, in Lea County.

First Abo oil from the shallow Artesia field of Eddy County has been completed by Pan American Petroleum Corp. at its 1-BC State. Daily potential was 138 bbl. of oil through ¼-in. choke, from perforations in the reef at 6,124-52 ft. Location is 12 miles southeast of Artesia in 4-18s-28e, and 1¾ miles east of Abo oil in the Empire area.

Fire damages Ohio drilling rig

IN OHIO, a scheduled Clinton test in Moreland pool, 8 R. J. Dial, Section 3, Franklin Township, Wayne County, struck Newburg pay with an open flow of 11,440 M.c.f.d. After running the tubing, the gas burst into flames, apparently from a spark from the motor.

To prevent the possibility of the spudder mast falling across the hole, the front guy wires were released and by hooking to the back guys the mast was pulled back over the machine. Bulldozers hooked their winch lines to the spudder and pulled it clear of the location. Four two-wheel Ansul units formed a semicircle around the flame and while being sprayed with water moved in and extinguished the fire on the first attempt. Complete control was gained in about 4 hours from the time the fire started.

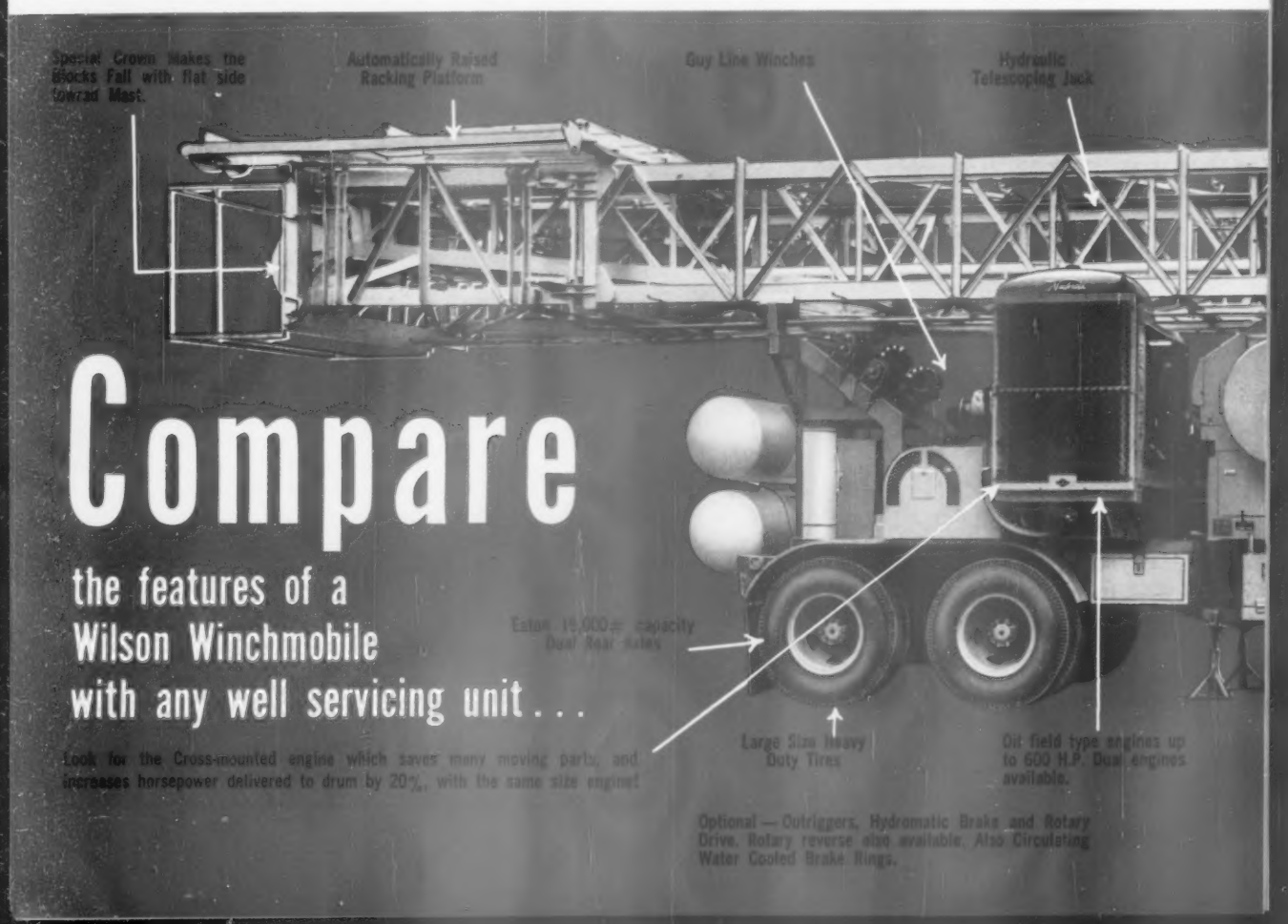
The drillers had only minor burns but the 36L spudder and drilling equipment of contractor Earl Mossholder was extensively damaged.

The operators, Ohio Fuel Gas Co. reported the well finaled at 8,750 M.c.f.d. with a rock pressure of 750 psi. The Newburg sand was logged at 2,988-3,056 ft.

Ohio gets first Glenwood pay

THE FIRST oil production in the Glenwood and Cambro - Ordovician dolomites has caused a flurry of excitement in Ohio as Monk Oil & Gas Co. announced the completion of 2 J. N. Monk, Section 22, Bennington Tp., Morrow County.

This rank wildcat was reported as having made 85 bbl. of Corning grade oil in a 11-hour test after acid treatment. The sonic, neutron, LateroLog and gamma ray logs indicated shows in four horizons; 3,589-91 ft., 3,606-17 ft., 3,627-32 ft. and 3,703-08 ft., however, the latter two were highly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saturated with water. The casing was perforated from 3,596-to 3,600 ft. and from 3,623-28 ft. and each of these zones was treated with 1,000 gal. of acid.

This well is the second success this year in the search for deep-pay production of 12 tests made in the state. The first success was a gasser, Ohio Fuel Gas Co., East Ohio Gas Co. & Wiser Oil Co. 1A F. Smith, Lot 69, Hinckley Tp., Medina Company (OGJ, 2-16-59).

Monk Oil and Gas Co. have scheduled an immediate followup about 2,000 ft. south.

Second pay tested in East Texas well

In the East Linden area of Cass County, East Texas, a confirmation well and production test on a new pay in the same well have been reported by Pan American Petroleum Corp.

Pan American's 1 S. Shelton flowed 382 bbl. of 48.5°-gravity oil a day from the lower Cotton Valley through a 14/64-in. choke on production test. Recovery was through perforations at 10,492-10,560 ft. with top of pay at 10,492 ft.

On a production test of the Pettit lime discovery, the well pumped 58 bbl. of 36.6°-gravity oil a day from perforations at 6,908-14 ft. Pay was topped at 6,908 ft. The well was drilled to a total depth of 10,680 ft., then plugged back to 10,580 ft.

The Shelton is a 1-mile-east extension of the firm's discovery, the 1 Earl Giraud, which was triple-completed in the Cotton Valley several months ago for a total estimated potential of over 500 bbl. of oil a day.

The Shelton well is in the Joshua Turner Survey, A-1032, Cass County. Pan Am owns full interest in the Shelton and the Linden area discovery well, as well as full interest in an 8,300-acre block in the area.

The two wells are 5 miles southeast of the town of Linden, Tex., and 5 miles northwest of the Kildare field, which produces from the Glen Rose and Pettit zones.

Two Mississippian hits hinted in Panhandle

The growing search for Mississippian production in the Texas Panhandle paid off twice last week. Shamrock Oil & Gas Corp. 1 Peterson, Section 930, Block 43, H&TC Survey, is an indicated oil well on the edge of Barlow Morrow gas field.

The 1 Carl Ellis et al is a prospective gas discovery 1½ miles southeast of similar production at 2 Kelln. Location is Section 918.

Texas well set for triple completion

TRIPLE COMPLETION has been slated at a wildcat in Van Zandt County, East Texas, after the well flowed wet gas from the Cotton Valley formation, plus oil from the Rodessa and James limestones.

The well is R. J. Caraway and Pan American Petroleum Corp. 1 McCoy. Estimated total rate of production from all three zones was 375-450 bbl. of oil, plus wet gas at the rate of 2 M.M.c.f.d.

Cotton Valley gas is from perforations at 10,522-32 ft. Drill-stem tests to 10,551 ft. also flowed gas.

The Rodessa flowed at the estimated rate of 175-200 bbl. of 42° oil a day through perforations at 8,184-94 ft.

The James limestone flowed at the rate of 200-250 bbl. of 44° oil a day through ½-in. choke from perforations at 8,286-93 ft.

No. 1 McCoy was drilled to 13,586

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ft. but was plugged back after getting no shows in the Smackover formation.

The well is located about 1 mile southeast of Fruitvale townsite, in the James Chesire Survey of Van Zandt County. It is 5 miles northeast of Fruitvale field, which has one shut-in Smackover well. Geological location is along the so-called "Smackover Trend" which curves in a great arc from the northeastern tip of Texas, west and south to Mexia in Limestone County.

Nearest Cotton Valley production to 1 McCoy is Pan American Petroleum 1 Earl Giraud, which opened East Linden field some 90 miles to the east in Cass County.

Wyoming adds prolific completion

One of the largest oil wells in the West Desert Springs area of Sweetwater County, Wyoming, is the 3-28m Pubco Playa Unit, located in SW¼ SW¼ 28-20n-99w. It flowed 480 bbl. of 46°-gravity crude oil through a 22/64-in. choke in the 24-hour period. Flow pressures were 550 lb. on the casing and 250 lb. on the tubing. This well is located in the extreme southwestern corner of the 22,538-acre proposed Playa Unit which includes 10,575 acres owned by Pubco. Pubco already has two shut-in gas wells on the eastern border of the unit in the Desert Springs area. Pubco plans to continue the development of the Playa Unit area immediately following the final approval of the unit by the United States Geological Survey.

West Texas outpost flows Devonian oil

A semiwildcat, or long extension well in the Azelea area of Midland County has indicated production from the Devonian.

Texas Pacific Coal & Oil Co. and Forest Oil Corp. 1 C. W. Lay, Section 45, Block 37, Township 1 South, T&P Survey, is 9 miles east of Midland and 1¼ miles southeast of a recent 3-mile northeast extension to Strawn and Devonian production in Azelea field.

On 3½-hour test of the Devonian at 11,354-11,446 ft., the well flowed gas at the rate of 1,090 M.c.f.d., plus 8.28 bbl. of 53° condensate an hour. Flowing pressure ranged from 2,000-2,600 psi., increasing to 4,800 psi. when shut in.

Operators set casing at 11,446 ft., total depth, for completion attempt from the Devonian.

Earlier a drill-stem test in the Strawn at 10,335-95 ft. flowed a small amount of gas and condensate.

Gas find opens Pennsylvanian area

IN PENNSYLVANIA, four wells are being drilled on the Laurel Hill anticline in Fayette and Somerset counties by Manufacturers Light & Heat Co. One of the wells, the 1 Mueller-Herr, had an open flow of 4,500 M.c.f.d., after fracturing. Rock pressure is 3,450 psi. in 15½ hours.

Onondaga was found at 6,825 ft., chert at 6,841 ft., and the Oriskany at 7,000 ft. The operator completed the well at a total depth of 7,039 ft. in the Oriskany sand. Open flow before fracture was only 70 M.c.f.d.

This is an important discovery for southwestern Pennsylvania, opening up a considerable new gas area for future exploration.

West Texas deep test brings in new pay

Flush Devonian oil production has been assured at a wildcat well 1 mile west of Andrews in central Andrews County. Texaco Inc. 17 Aurelia Cobb

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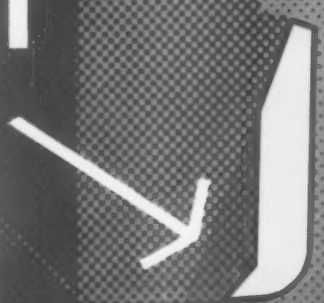

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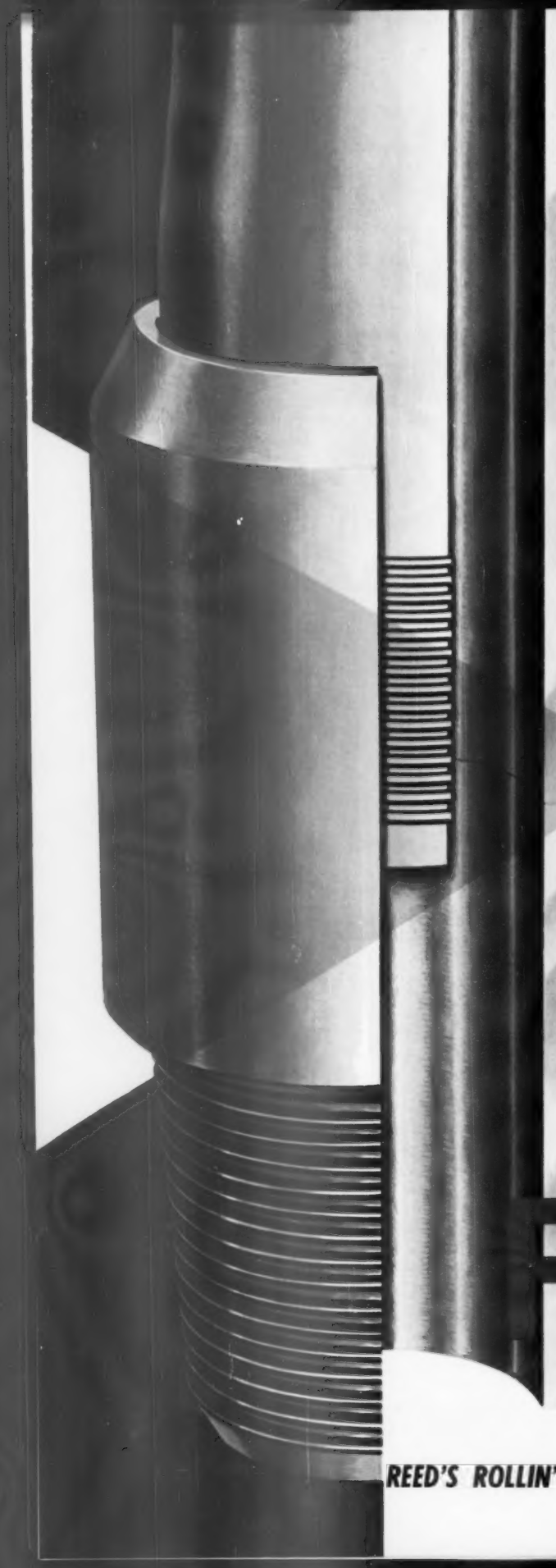

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has recovered oil from several tests of the Devonian and is drilling ahead on 12,700-ft. contract, apparently to test the Ellenburger.

At 10,410-84 ft. in Devonian rocks, the well had a small flow of gas and tanked 225 bbl. of oil in 3 hours through 5/8-in. choke. Flowing pressure ranged from 1,900-3,945 psi., increasing to 4,350 psi. when shut in 30 minutes. Additional pay was indicated when oil was recovered from 10,490-10,574 ft.

The new well is in an area of shallow Permian and Wolfcamp production. It is approximately ½ mile southeast of Texaco's 20-H Parker, recent Ellenburger and Strawn discovery. Location is in Section 16, Block A-46, PSL Survey.

Discovery wells

CALIFORNIA

Kern County: Ned Barmore; Hopkins, NW NE 25-25s-27e, 50 BOPD, perfs. 52 ft. above 1,862 ft., TD 1,862 ft. (New pool discovery 2 miles southeast of Jasmin field.)

Monterey County: Richard R. Thorup, 2 Thomas Doud Estate, SW NW 32-20s-8e, 83 BOPD, 15.1° gravity, 20% cut, perfs. 2,009-2,130 ft., TD 2,483 ft. (New field discovery 17 miles northwest of San Ardo field.)

WESTERN CANADA

Alberta: Mic Mac et al. 14-12-50-8 North Pembina, LSD 14, 12-50-8w5. Cardium oil discovery. TD 4,638 ft.

Union 7-6-61-1 Westlock, LSD 7, 6-61-1w5. Viking sand gas discovery. TD 2,621 ft.

Shell 6-22-31-9 Burnt Timber, LSD 6, 22-31-9w5. Mississippian gas discovery. TD 12,050 ft.

Dynamic Wester 11-16-22-8 Jenner, LSD 11, 16-22-8w4. Blairmore gas discovery. TD 3,462 ft.

British Columbia: Pacific Sunray Imperial D68-E East Laprise, 68-E-94-H-5. Triassic gas discovery. TD 4,800 ft.

MICHIGAN

Osceola County: Robert Bond 1 Van Antwerp, SE SE SE 19-20n-10w, Burdell Township, 11 miles north of Reed City oil field. Elev. 1,203 ft. IP 127 BOPD, Dundee 3,672 ft., pay 3,678-83 ft. TD 3,638 ft. New field.

NORTHWEST NEW MEXICO

San Juan County: El Paso Natural Gas Co. 111 Huerfano, NE NW 20-26n-9w. IPF 1,923 M.c.f.d., ¾-in. choke, Gallup 5,603-5,894 ft.; IPF Dakota 3,410 M.c.f.d., ¾-in. choke, 6,455-6,723 ft. TD 6,785 ft.

El Paso 8 Lodewick, SE SE 19-27n-9w. IPF 2,615 M.c.f.d., Dakota 6,702-6,954 ft., ¾-in. choke. TD 7,072 ft. Dakota discovery, new field.

Southern Union 2 McCord, NW SW 34-30n-13w. IPF 3,550 M.c.f.d., plus 69 BDPD, Dakota discovery, new pool. TD 6,352 ft.

Benson-Montin-Greer 1 Pilgrim, SW SW 35-25n-8w. IPP 17 BOPD, Dakota discovery, new field. TD 7,268 ft.

(Continued on page 157)

NORTH DAKOTA

Dunn County: Amerada Petroleum Corp. 1 Signalness Unit, SW SE 10-148n-96w. IPF 313 BOPD, 36 bbl. acid and salt water per day, 10/64-in. choke, 41.1°, TP 1,250 psi., GOR 578:1. Duperow 11,538-72 ft. TD 11,660 ft. Opens Lost Bridge field.

OHIO

Ashtabula County: Smith & Mouser 1 John Roach, Lot 31, Hartsgrove Township. IPF 3,297 M.c.f.d., Oriskany 2,288-2,308 ft. TD 3,740 ft. Rock pressure 826 psi.

Defiance County: G. L. Miller 1 Fee, Sec. 4, Mark Township. IP 5 BOPD, 300 M.c.f.d., Trenton 1,764-1,814 ft. TD 1,814 ft.

TEXAS PANHANDLE

Ochiltree County: Shamrock Oil & Gas Corp. 1 W. H. Dutcher "A," Sec. 584, of Perryton, 2 miles northeast of Parnell Lower Morrow gas field. IPCAOF: 730 M.c.f.d., Cleveland 7,208-7,318 ft. TD 9,585 ft.

UTAH

Uintah County: DeKalb Petroleum-Texaco Inc. 1 Uintah Unit, SE SE NE 16-10s-21e. IP Shut in gas discovery, new field. TD 5,606 ft. Flowed est. 5 M.M.c.f.d.

WYOMING

Sweetwater County: Gulf Oil Corp. 3 State Line Unit, NE SE 18-12n-94w. IPF 3 M.M.c.f.d., open flow, Wasatch discovery, new pay 3,246-56 ft. TD 3,980 ft.

Blk. 43, H&TC Sur., 11 miles southeast

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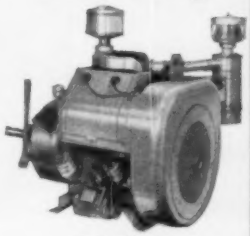
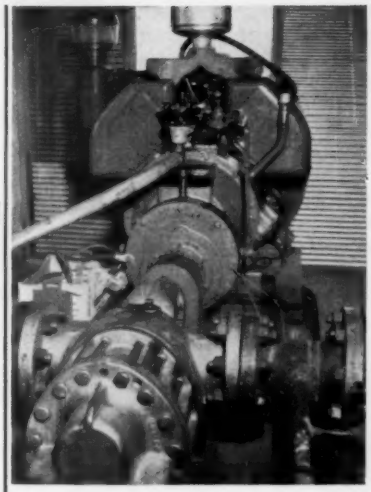


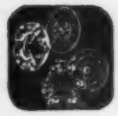
Helps Wisconsin Engines Drive Pumps, — Avoid — Shut Downs



Here is one of the 56 HP Wisconsin VR4D engines powering a rotary pump in a pipeline operation near Harrisburg, Nebraska. It was 35 degrees below zero when this picture was taken and summer temperatures hit 120 degrees above zero in the "dog house" enclosure. This engine and all the other VR4D's in the system must operate continuously throughout the winter because of the quick "set-up" of the heavy crude oil. One shutdown could eliminate the discharge flow through the entire system until the next spring.

ROCKFORD Speed Reducers incorporate a clutch, power take-off and reduction gear in one complete unit. This combination insures reliability under the most extreme conditions.

The ROCKFORD Clutch, Power Take-Off, Gear Reduction unit saves oil field operators servicing time and money.



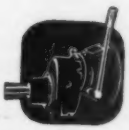
Small Spring Loaded

Heavy Duty Spring Loaded

Automotive Spring Loaded

Heavy Duty Over Center

Power Take-Offs



Speed Reducers

SEND FOR THIS HANDY BULLETIN
Gives dimensions, capacity tables and complete specifications. Suggests typical applications.

ROCKFORD Clutch Division BORG-WARNER
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CLUTCHES

Eldon Hunt: A Busy Canadian Pipeliner

- Alberta Gas Trunk Line's manager has worked his way up through the ranks to a top pipeline job.

WHEN ENERGETIC Eldon Vaiden Hunt arrived in Calgary in December 1954, Alberta Gas Trunk Line Co., Ltd., was just a few lines on a map.

Today the company operates one of the largest common-carrier systems in North America. It has 571 miles of completed pipeline with 900 more miles in the advanced planning stage (see related story, p. 46).

Albertans give most of the credit for the company's solid operational feats to General Superintendent Hunt. A U. S. import, the robust executive with iron-gray hair is a veteran of pipeline construction in many states.

An operations man who has been through the mill—dispatcher, field engineer, and a supervisor in all phases of construction—Hunt said it was the challenge of starting virtually from scratch that first attracted him to his position with Alberta Gas Trunk.

Taking on tough tasks has been the trademark of his career. He went to college at a time when most men settle down into a comfortable groove. One night in 1928, he came home to his wife and five children and told his wife: "Grab your bonnet . . . I'm going back to school."

ELDON V. HUNT, general superintendent of Alberta Gas Trunk Line, has one wall of his office covered with his collection of oil company and pipeline decals.

Early career . . . Born in Slater, Mo., in 1903, he was the son of a railroader working for the Santa Fe. It was only natural for young Hunt to follow suit. He became a telegraph operator, then a railway dispatcher.

In 1928 his dispatching experience led to a job in the natural-gas pipeline operations of the Colorado Interstate Gas Co.

One rainy night a young field engineer for Ford, Bacon & Davis, Inc., spoke glowingly of the advantages of a college education. "I was sold. For one thing, he was making $400 a month against my $145 a month."

Before Hunt could enter college, he had to finish his high-school education. As it developed, he entered Colorado Springs high school the same year his eldest son enrolled in first grade. He was 25 at the time. He earned his high-school diploma in a year and in 1929 was admitted to Colorado College, Colorado Springs.

"By the time I entered my senior year, all five of my children were going to school. It was a grind, but I had my wife to cheer me on."

Continuing to work as a dispatcher, he checked into work at 5 in the afternoon. Cramming as much homework as possible into slack periods, he ended his shift at 1 in the morning. Sleep then became the paramount concern. "My first classes started at 8 o'clock in the morning."

In 1933 he graduated with his hard-earned BS in civil engineering.

Recently, Hunt had occasion to reminisce about his precarious college days with C. C. Whittelsey, the young education-minded field engineer who went on to become president of Ford, Bacon & Davis. On a visit to Alberta, Whittelsey made a visit to Alberta Gas Trunk offices one of his first calls.

But back in the 1930's Hunt found his degree was no passport to immediate success. With the national economy in the doldrums, he continued in his old job as chief dispatcher, natural-gas pipeline operations, for Colorado Interstate.

The momentary dead-end street did not discourage him. "College opened new vistas. I never doubted the wisdom of going back to school."

In 1935 Hunt received his transfer to the engineering department of Colorado Interstate.

After attending the Army's engineering school at Fort Belvoir, Va., in 1938, Hunt joined the Corps of Engineers in 1940. He held the rank of colonel. His service included 2 years overseas in Europe and the Pacific.

Following the war, he took postgraduate studies at Cornell University. In 1946, Hunt was tapped for a big construction job for the armed services. He was put in command of reconstruction of the Thule Air Base in Greenland.

Back to pipelining . . . In 1947 he returned to the pipeline trade. His job

was assistant chief engineer, construction, with the Michigan-Wisconsin Pipeline Co.

Two years later he moved to Transcontinental Gas Pipeline Corp. as division superintendent, construction and operations. He joined Ebasco Services, Inc., in 1951 as construction superintendent, natural-gas pipelines, and later took over the job of assistant construction manager in charge of all the company's pipeline work in the U. S.

He was named general manager of the Key City Gas Co. in Dubuque, Iowa, in 1953. It was during his second year with this firm that the call came from Canada.

"I'd never been to Canada before, but it wasn't a tough decision to make. The job offered frontier-like opportunities in a young, thriving province. Moreover it was the west, and I've always been a westerner at heart."

Hunt has been busy running Alberta Trunk Line since 1954 other than during a brief leave of absence he took in 1955 to help pick a site and design a river crossing for the gas line which runs from Sui gas field to Karachi in India.

An exponent of team management, Hunt arrives at the office at 8:15 a.m., works through to about 5:30 p.m., then heads for a quiet evening at home.

"My briefcase stays at the office where it belongs," he says.

While administrative work takes 80% of his time, he still manages to make periodic trips into the field to "keep in intimate touch with all phases of operations."

●

M. E. Mendenhall, formerly geologist for Magnolia Petroleum Co. in Morgan City, La., has been named district geologist for Mobil Oil Co. in New Orleans. **F. P. Troseth,** district geophysicist in New Orleans for Magnolia, will be district geophysicist for Mobil there. **Basil Moss,** New Orleans district land man for Magnolia, will continue in this post for Mobil.

Fred Clarke, district pipeline superintendent in Houma, La., for Tennessee Gas Pipeline Co., has been named superintendent of a new operating division in the southern Louisiana-Mississippi area. Clarke will continue to headquarter in Houma until offices are relocated in Lafayette, La. **F. D. Hilsman,** Louisiana right-of-way agent, will succeed Clarke as Houma district pipeline superintendent. Tennessee Gas Pipeline is a division of Tennessee Gas Transmission Co.

John S. Sprowls, vice president and assistant to the president of Vickers Petroleum Co., Inc., has been elected a director of the company.

Harold W. Mohrman, director of research-associated interests for Monsanto Chemical Co.'s plastics division, has been appointed director of research for the company's overseas division, a new position. He will headquarter in St. Louis.

R. L. Vockel, Waverly Oil Works Co., has been elected president of the Ohio Oil and Gas Association. **R. C. McConnell,** Clinton Oil Co., will be vice president, and **S. A. Anderson,** National Gas & Oil Corp., is treasurer.

John H. McWilliams, formerly assistant manager of Sun Oil Co.'s land department, has succeeded **Winfield Givens** as department manager. Givens recently retired. McWilliams also becomes vice president and a director of Sun's nine foreign production subsidiaries.

Daniel H. Benckart, assistant manager of wholesale sales for Pennzoil Co., subsidiary of South Penn Oil Co., has been promoted to executive assistant, branded marketing department. He is slated to become head of this department May 1 when **David G. Proudfoot,** present department head, will retire. **John F. Hadley** has been promoted to assistant manager, wholesale sales, succeeding Benckart.

HUTCHISON

Alvin M. Hutchison, assistant manager of transmission for Ohio Fuel Gas Co., has moved up to manager of transmission. He succeeds **J. H. Lang,** who has retired. Hutchison has been with the Columbia Gas system companies 32 years and with Ohio Fuel since 1930. He was superintendent of gas measurement before being named assistant manager of transmission in 1958.

Charles P. Fullerton, senior project specialist in Monsanto Chemical Co.'s plastics division development department in Texas City, has been appointed a development associate at the Texas City plant. **Dr. W. F. Hamner,** group leader, has been appointed section leader in the research department of the Texas City plant. **Greg W. Daues,** assistant group leader, has been promoted to group leader in the research department, Texas City.

▶▶▶ Personals

Gordon M. Mace, Jr., former president of Marine Exploration Co., Houston, has been elected a vice president of Independent Exploration Co., Houston. Mace joined Independent when it purchased geophysical operations of Marine Exploration. Mace helped organize Marine Exploration in 1946 and had been its president since that time.

Kenneth W. Conner, assistant Rocky Mountain division superintendent for Loffland Brothers Co., has been promoted to Rocky Mountain division superintendent. He will headquarter in Casper, Wyo. Conner has been with Loffland Brothers since 1937.

James R. Anslow has joined Jefferson Chemical Co.'s research laboratories in Austin, Tex., as senior research chemical engineer. Anslow was with the old Magnolia Petroleum Co., Monsanto Chemical Co., and Escambia Chemical Co. before joining Jefferson.

John S. Rives has been elected 1960 president of South Texas Geological Society. Rives is with George H. Coates, San Antonio independent. Other new officers include **Roy H. Guess,** Newman Brothers Drilling Co., vice president; **Charles E. Kimmell,** Bright & Schiff, secretary; and **Wilford L. Stapp,** Phillips Drilling Co., treasurer. Members of the executive committee are **Robert L. Begeman,** Tobin & Begeman; and **James G. Joyce,** Standard Oil Co. of Texas.

Ohio Oil Co.'s general sales division has been reorganized into three departments — branded sales, refinery sales, and commercial and special products sales. **M. A. Newman,** general sales manager, will be in charge of the three departments. **E. J. McGarvey,** formerly an assistant sales manager, has been named manager, branded sales department. **William T. Kirkbride,** formerly assistant sales manager, will be manager of refinery sales; and **A. D. Lodge,** formerly supervisor of technical services, will be manager of the commercial and special products sales department. **R. J. Powell** has been appointed assistant manager in refinery sales. **I. W. Lloyd** is assistant manager in commercial and special products sales.

Personals

Maynard L. Landa, petroleum economics coordinator for the Cities Service companies, has been elected vice president of Cities Service Petroleum, Inc. Landa joined Cities Service in 1919 as a junior engineer. He had been petroleum economics coordinator for the system since 1953.

Carl Pfeiffer has been appointed process engineer for SunOlin Chemical Co. He will work with technical economics and process design studies of chemical plants built for SunOlin. Pfeiffer was with Houdry Process Corp. and Catalytic Construction Co. before joining SunOlin.

Dr. R. J. Runge has been appointed senior research physicist, theoretical geophysics, in the geophysics research division of California Research Corp.'s La Habra, Calif., laboratory. **Dr. H. Brandt, Dr. E. L. Dougherty,** and **Dr. H. Y. Jennings,** have been appointed group supervisors at La Habra. Brant will be in the producing technology division, Dougherty in the oil-recovery division, and Jennings, in the gas processing and producing technical service division.

Ray Powell, superintendent of the Lawrenceville, Ill., refinery of Texaco Inc., has been promoted to assistant general manager of the refining department with headquarters in Houston. Powell will act as advance man for the move of Texaco's refining department to Houston from New York. The change is expected in the second quarter this year. **W. G. Copeland,** general manager of the refining department in New York, will move to Houston with the department. **Frederic H. Holmes,** vice president in charge of refining, will remain in New York. In Lawrenceville, **Frank D. Dorr,** assistant superintendent in charge of operations, will succeed Powell as superintendent. **Harry R. Robinson,** assistant superintendent in charge of maintenance and construction, will succeed Dorr. Robinson will be succeeded by **Donald N. Graham,** supervisor of operations. **Robert C. McCay,** chief process engineer, will be supervisor of operations, and **W. Michael Neuman,** senior product engineer in the New York petrochemical department, will succeed McCay in Lawrenceville.

John D. Tackett, engineer for Service Pipe Line Co. in Tulsa, has been transferred to Baytown, Tex., and assigned to the Bayou Pipe Line system.

R. G. Keearns, Jr., resident engineer in Great Lakes Pipe Line Co.'s northwestern area, **R. J. Soukup,** northern area resident engineer, and **A. V. Spitser,** southern area resident engineer, have been appointed area engineers.

David Louthan, senior vice president of Williams Brothers, has been appointed head of the London office of the company's British subsidiaries, Willbros (U.K.), Ltd., and Willbros (Overseas), Ltd. Louthan was formerly in Cochabamba, Bolivia. Other Williams Brothers men in the London office are **Albert C. Setrella** and **A. W. Brooks,** plus the local Willbros London staff.

Ross E. Williams, assistant to the vice president and general manager of domestic and foreign crude-oil production for Atlantic Refining Co., has been appointed manager of the domestic crude-oil valuation and budget division. He succeeds **W. F. Maxwell,** who has retired after 42 years with the company.

J. A. Horner, secretary of Shell Oil Co. in New York, has been elected president of Shell Pipe Line Corp., Houston. Horner succeeds **Joe T. Dickerson,** who has retired after 33 years with Shell and its subsidiaries. Horner joined Shell in 1936. He was administrative assistant to the president before being named assistant secretary and then secretary of Shell. He has also been vice president of Shell Development Co. and secretary of Shell Chemical Corp., International Lubricant Corp., and Shell Canadian Exploration Co.

HORNER

Waldo E. Jackson, senior geophysicist in Corpus Christi, Tex., for Mobil Oil Co., has been transferred to Midland, Tex., as district geophysicist. He succeeds **James C. Eley,** who has resigned. **Howard Boyd,** formerly in San Antonio, Tex., and **Walter Hatton,** formerly in Mobile, Ala., have been transferred to Midland in the Mobil district land department. Also, **Charles A. Reinke** and **A. Stinnett,** formerly geologists in Midland for Mobil, have been transferred to the new Lubbock, Tex., producing district.

E. Howard Fisher, general superintendent of pipeline operations for Pacific Gas & Electric Co., has been elected vice president in charge of gas operations. He succeeds the late Philip E. Beckman. Fisher was manager of gas supply and control for Coast Counties Gas & Electric Co. before the company was merged with Pacific Gas & Electric in 1954.

Garth L. Young, vice president for foreign operations and a director of Signal Oil & Gas Co., has been elected president of Signal Oil & Gas of Venezuela. He succeeds **Arthur A. Curtice,** who has resigned. The appointment is effective January 31. Curtice, president of the Venezuelan company since 1957, will open consulting offices in New York (OGJ, Dec. 14, p. 142).

John H. Crow, Graff Engineering Corp., has been elected 1960 chairman of the Dallas section of American Institute of Chemical Engineers. He succeeds **R. E. Styring, Jr.,** Atlantic Refining Co. Other new officers include **David L. Nicol, Jr.,** Southern Union Gas Co., vice chairman; and **John L. Chadwick,** Delhi-Taylor Oil Corp., treasurer.

Dr. Mott Souders, Jr., director of oil development at Shell Development Co.'s Emeryville, Calif., research center, has been elected a fellow of the New York Academy of Science. Election to fellowship recognizes outstanding achievement in science.

L. E. Warren, exploration manager for Western Gulf Oil Co. in Los Angeles, has been appointed Denver production division exploration manager for Gulf Oil Corp. He succeeds **H. D. Bedford,** who will retire February 1 after 37 years with Gulf. Warren was assistant district exploration manager in Midland, Tex., before moving to Los Angeles with Western Gulf.

R. A. Keller, formerly assistant Gulf Coast division superintendent for Rowan Drilling Co., has been named superintendent of Rowan's northwest division, Williston, N. D. He succeeds **D. S. Luse,** who has retired after 30 years with the company. Luse had been division superintendent in Williston since 1952. He was assistant West Texas division superintendent before that time. Keller has been with the company since 1947.

Hans A. Bieling, former shareholders representative in West Germany for Caltex, has joined Continental Oil Co. as West German representative.

J. R. Marchi, vice president of Great Northern Drilling Co., Billings, Mont., will head the company's new Denver office.

J. S. Moore, petroleum engineer for Pan American Petroleum Corp., has been appointed Edmonton area engineer.

Ike W. Taylor, Lewistown, Mont., drilling contractor and independent operator, has been named to serve the unexpired term of **Don E. Hageman** on the Montana Oil and Gas Conservation Commission. Hageman has resigned. His term expires April 1.

Earl W. Weaver, formerly executive assistant to management of Ashland Oil & Refining Co., has been named manager of branded marketing. He will be responsible for general management of Ashland's four branded marketing divisions, and supervision of sales and operations for motor oils and lubricants in domestic and foreign markets. Weaver is a former marketing operations manager for Ashland.

J. C. Fitzgerald has been named a director of Bataafsche Internationale Petroleum Mij., N.V., and **H. William Slotboom** has been appointed a director of Shell International Research Mij., N.V.

F. W. Spooner, assistant to the national sales manager of Shell Oil Co., has been promoted to manager. National sales is a coordinating department handling sales which cross Shell marketing boundaries.

D. R. Wall, formerly manager of crude-oil purchases and sales for Magnolia Petroleum Co., has been appointed manager of Mobil Oil Co.'s crude-oil purchases and sales department in Dallas. **John R. Guynes,** formerly manager of purchases for Magnolia, has been named regional manager of purchases for Mobil Oil's southwest division. He will headquarter in Dallas.

John H. Osborne, chief dispatcher of Buckeye Pipe Line Co.'s eastern products division, has been appointed assistant to the vice president in Macungie, Pa. **Charles Oleska** will succeed Osborne. Osborne has been with Buckeye since 1952.

▶▶▶ Personals

R. W. Harris, recently named vice president of El Paso Natural Gas Co., has been named manager of the company's new Rocky Mountain division, Salt Lake City. Opening of the new regional headquarters is a result of the El Paso-Pacific Northwest Pipeline Corp. merger. **H. P. Logan,** formerly assistant superintendent of the San Juan division, Farmington, N. M., will be superintendent of operations in Salt Lake City. **Ed Alsup,** Farmington, will continue as superintendent of operations for the San Juan division.

HARRIS

John R. Petty, formerly assistant superintendent of the Los Angeles terminal of Texaco Inc., has been appointed superintendent of the Galena Park terminal, near Houston. He succeeds **Olen M. Webb,** who has retired. Webb joined Texaco in 1917. He was assistant superintendent of the Lockport, Ill., works before moving to Houston.

▶▶▶ Deaths

John E. Orrell, 49, chief mechanical engineer in Shell Oil Co.'s Midland, Tex., area, died January 3 in an Amarillo, Tex., hospital after suffering a cerebral hemorrhage. Orrell had moved to Midland several months ago from Shell's Los Angeles area where he was also chief mechanical engineer.

Homer Clarence Gilger, 83, Tulsa independent operator, died January 5 in a Tulsa rest home. Gilger was field superintendent for the old Iron Mountain Oil Co. before becoming an independent in 1940.

Albert L. Burns, 67, president of Gulf Printing Co., Houston, which prints the Gulf publications, died December 31 when his private plane crashed near Houston during a storm. Burns, who was returning from a hunting trip with relatives, was piloting the plane. Two other passengers suffered minor injuries.

C. L. Lantz, 57, superintendent of Gulf Oil Corp.'s Kiefer, Okla., gasoline plant, died January 4 in a Sapulpa, Okla., hospital of a heart ailment. Lantz had been with Gulf since 1923.

J. K. (Booty) Adams, 59, manager of the land department for overseas operations of Tennessee Gas & Oil Co., died January 4 in a Houston hospital after an operation for a stomach ulcer. Adams joined Tennessee Gas Transmission Co., the parent company, in 1954. He had been with several other oil firms before that time, including 21 years with the late Mills Bennett, Houston independent.

John A. O'Neill, Jr., 65, retired Tulsa district salesman for Texaco Inc., died January 4 in a Tulsa hospital. O'Neill retired last November after 44 years with Texaco. He joined the company in San Antonio, Tex., and had been in Tulsa since 1942.

Russell Clayton Gates, 34, land man with Pan American Petroleum Corp., died December 29 in Tyler, Tex., after a short illness. Gates had been with Pan Am since 1952.

Harry H. Ament, Sr., 59, assistant manager in charge of supply and distribution for DX Sunray Oil Co., died January 2 in Tulsa after a heart attack. Ament had been with DX Sunray and its predecessors for 35 years.

G. W. Frogge, Kansas City independent, died recently at his Prairie Village, Kans., home. He was 59.

Rees F. Tener, 63, assistant chief of the testing and specifications section, National Bureau of Standards, died December 25. Tener had been with the Bureau of Standards since 1924. He served in the rubber section before moving to testing and specifications in 1930.

Jack R. Woodward, 39, engineer with Phillips Petroleum Co. in Bartlesville, Okla., died December 30 in a Bartlesville hospital after a long illness.

John G. Pundt, 69, Dallas independent operator, died December 31 in Dallas. Pundt had been in the oil industry 40 years, operating in Arkansas, Louisiana, and Texas. He was one of the organizers of Tennessee Gas Transmission Co. in the 1940's.

Leonhart N. Donaldson, secretary of West Penn Oil Co., Inc., West Penn Closure Corp., and West Penn Oil Co. (Canada), Ltd., died recently in Warren, Pa.

Gasoline-plant operations are changing

BY JOHN C. CASPER

CHANGES in product demand at refineries are having a definite effect on operations at natural-gasoline and cycling plants. These shifts will increase, at least for a few more years.

Since the end of World War II, there has been a steady rise in the octane quality of gasoline. This high-octane material increased with each boost of the compression ratio of automobile engines. It has been a question whether refiners raised gasoline quality to meet automotive needs or if car manufacturers increased compression ratios because they knew the required fuel was already available.

This rapid rise in octane quality of motor gasoline has tended to restrict the use of gas liquids with low octane values.

In the Group 3 area pipeline-quality regular gasoline was 86 octane throughout 1955 and up to the first of May 1956. At that time, the pipeline specification was raised to 88 octane, but it held for only 1 year. The boost to 89 octane was in May 1957. The latest increase came in July 1959 when housebrand gasoline moved up to 91 octane.

From the spring of 1956 to the summer of 1959, quality of Group 3 regular gasoline increased five octane numbers. This same octane race called for processing shifts in other refining areas. These changes have resulted in a definite need for high-octane blending components from natural-gasoline and cycling plants.

A quick look at the highlights

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,099,450	DOWN	44,710	DOWN	33,894
Crude stocks	255,454,000	DOWN	942,000	DOWN	7,725,000
Completions	836	DOWN	294	UP	372
Refinery runs	8,369,000	UP	103,000	UP	113,000
Gasoline stocks	188,966,000	UP	4,921,000	UP	2,484,000
Kerosine stocks	26,771,000	DOWN	309,000	UP	714,000
Distillate stocks	148,807,000	DOWN	2,634,000	UP	22,751,000
Residual stocks	49,938,000	DOWN	513,000	DOWN	10,587,000
Four-product stocks	414,482,000	UP	1,465,000	UP	15,362,000
Total imports	1,662,300	DOWN	75,300	DOWN	482,800

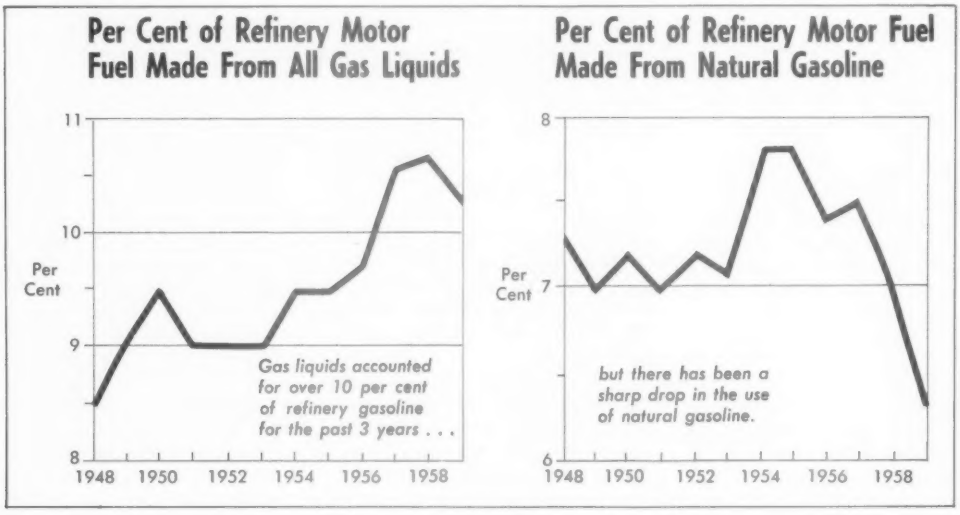
The old 26-70 natural gasoline did not meet these requirements. Plant operators now strip much of the butane from the natural-gasoline stream, leaving a butane-free portion to be converted by the refiner into blending materials with higher octane values.

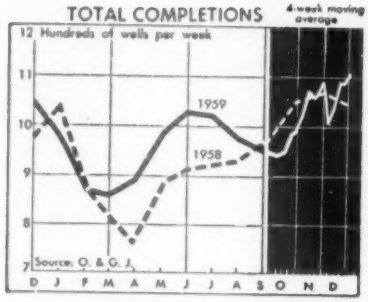
The first chart at bottom of the page pictures the per cent of refinery motor fuel that can be credited to natural-gas liquids for the period 1948 through 1959. Note that there was a definite upward trend in the use of gas liquids until 1959. Even after the downturn in 1959, natural-gas liquids accounted for better than 10% of all refinery-produced gasoline.

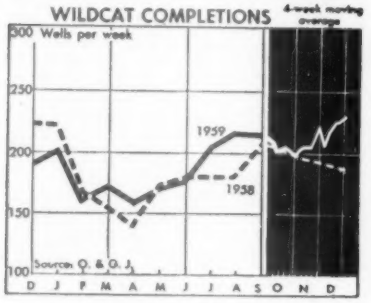
Refiners continue to use large quantities of gas liquids in the production of gasoline, but the right chart shows that the use of natural gasoline as such has not kept pace with the refiner's output of motor fuel.

Some refiners have found profitable markets for LRG and are using less of these products in gasoline blends. This shift shows up as a gain in percentage yield of LRG at refineries. The output of this group of products has jumped from 1.34% of crude in 1954 to an estimated 2.29% for 1959.

Thus, the average refiner is selling more of the light products made from crude and increasing his purchases of butanes and isobutanes from natural-gasoline plants. The combination of these purchases and other chemical requirements has created a near-shortage of butane this winter.







Active Rotary Rigs

	1-4-60	12-28-59	1-5-59
Alabama	5	5	8
Arkansas	14	13	15
Arizona	0	0	0
California	78	87	87
Land	71	80	82
Offshore	7	7	5
Colorado	39	39	31
Florida	1	1	1
Land	1	1	1
Offshore	0	0	0
Illinois	34	33	42
Indiana	7	7	2
Iowa	0	1	3
Kansas	123	139	141
Kentucky	10	10	6
Louisiana	286	297	329
North	30	32	37
S. Inland waters	110	113	138
S. Land	95	98	122
Offshore	51	54	32
Maryland	0	0	2
Michigan	37	41	12
Mississippi	68	77	57
Missouri	1	1	1
Montana	18	22	18
Nebraska	24	29	19
Nevada	0	0	0
New Mexico	114	113	102
New York	0	0	0
North Dakota	25	30	33
Ohio	4	3	2
Oklahoma	188	194	194
Oregon	0	0	0
Pennsylvania	14	14	10
South Dakota	5	4	0
Texas	662	655	784
S. Inland waters	3	6	4
S. Land	177	175	150
Offshore	3	0	2
North-East	160	165	168
West Central	218	210	301
West	101	99	159
Utah	27	30	35
Washington	1	1	0
West Virginia	4	4	3
Wyoming	64	63	68
Total U. S.	**1,853**	1,913	2,005
Western Canada	223	222	193
Eastern Canada	1	1	0
Grand total	2,077	2,136	2,198

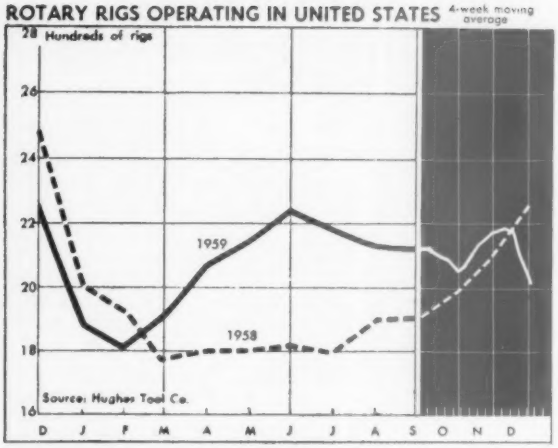
Hughes Tool Co. report.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JANUARY 2, 1960

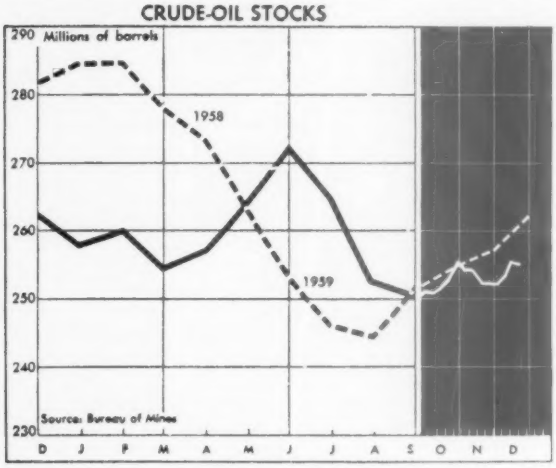
	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1960	1959	Total	Crude	Cond.	Gas	Dry	1960	1959
Alabama	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	1
Arizona	0	0	0	0	0	0	0	0	.....	0	0	0	0	0	0	.....
Arkansas	14	8	0	2	4	0	46,168	14	19	3	0	0	0	3	3	5
California	39	25	0	1	11	2	165,387	39	49	9	1	0	0	8	9	10
Colorado	24	5	0	2	17	0	127,362	0	11	13	2	0	0	11	0	6
Illinois	25	13	0	1	11	0	52,140	0	41	3	0	0	1	2	0	9
Indiana	16	7	0	1	8	0	24,888	0	11	4	0	0	0	4	0	3
Kansas	47	17	0	8	22	0	150,525	0	81	14	2	0	1	11	0	22
Kentucky	56	34	0	2	20	0	64,218	0	29	16	1	0	1	14	0	2
Louisiana	42	19	0	7	16	0	148,911	42	31	8	0	0	0	8	8	11
North	42	19	0	7	16	0	148,911	42	31	8	0	0	0	8	8	11
South	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Michigan	17	6	0	1	10	0	53,293	17	16	5	1	0	0	4	5	3
Mississippi	19	6	0	1	12	0	193,520	19	11	9	2	0	0	7	9	7
Montana	5	2	0	0	3	0	31,841	0	9	3	0	0	0	3	0	1
Nebraska	16	3	0	0	13	0	92,093	0	7	9	1	0	0	8	0	3
New Mexico	42	24	5	6	6	1	200,118	42	0	3	0	0	0	3	3	0
West	17	4	5	6	1	1	93,218	17	0	0	0	0	0	0	0	0
East	25	20	0	0	5	0	106,900	25	0	3	0	0	0	3	3	0
New York	19	12	0	0	3	4	22,514	0	5	0	0	0	0	0	0	0
North Dakota	4	2	0	0	2	0	25,282	0	7	1	0	0	0	1	0	2
Ohio	52	11	0	13	10	18	96,841	52	0	2	0	0	0	2	2	0
Oklahoma	55	39	0	2	14	0	174,682	0	96	0	0	0	0	0	0	25
Pennsylvania	54	14	0	24	5	11	159,819	0	0	0	0	0	0	0	0	0
South Dakota	1	0	0	0	1	0	8,911	1	.....	1	0	0	0	1	1	.....
Texas	261	89	20	24	120	8	1,179,496	261	0	68	2	0	1	65	68	0
Dist. 1	21	8	1	1	11	0	65,243	21	0	9	0	0	0	9	9	0
Dist. 2	22	5	3	5	9	0	141,152	22	0	7	1	0	0	6	7	0
Dist. 3	36	10	8	6	12	0	246,648	36	0	6	1	0	0	5	6	0
Dist. 4	31	6	6	5	14	0	186,087	31	0	8	0	0	1	7	8	0
East	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dist. 7-B	33	9	0	1	23	0	128,700	33	0	12	0	0	0	12	12	0
West	35	9	0	2	24	0	201,283	35	0	13	0	0	0	13	13	0
Dist. 9	73	38	1	1	25	8	129,017	73	0	11	0	0	0	11	11	0
Dist. 10	10	4	1	3	2	0	81,366	10	0	2	0	0	0	2	2	0
Utah	10	1	0	2	7	0	35,106	0	5	8	0	0	1	7	0	2
West Virginia	0	0	0	0	0	0	0	0	19	0	0	0	0	0	0	1
Wyoming	16	6	0	2	8	0	91,505	0	10	4	0	0	1	3	0	5
Misc. (Wash., Florida)	2	0	0	0	2	0	17,257	2	3	2	0	0	0	2	2	2
Total U. S.	**836**	343	25	99	325	44	3,161,877	489	464	**185**	12	0	6	167	110	120
Previous week	1,130	555	42	91	414	28	4,428,652	.....	.....	236	17	5	6	208	.....	.....
Cum. 1960	489	188	25	55	192	29	2,109,902	.....	.....	110	6	0	1	103	.....	.....
Cum. 1959	464	193	1	42	209	19	1,746,522	.....	.....	120	20	0	5	95	.....	.....
Western Canada	71	41	0	8	21	1	360,785	71	0	18	1	0	4	13	18	0

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	12-26-59	12-19-59	12-27-58
Pennsylvania	2,380	2,382	2,613
Other Appalachian	1,261	1,986	1,648
Illinois, Indiana, Michigan	9,574	9,743	10,194
Nebraska and North Dakota	3,343	3,214	2,489
Kansas	9,880	10,064	10,299
Oklahoma	16,731	16,580	16,585
Arkansas	2,011	2,066	2,103
Louisiana	17,428	17,998	17,394
North	3,213	3,538	2,946
South	14,215	14,460	14,448
Mississippi, Alabama, Florida	2,408	2,126	2,422
New Mexico	7,952	8,226	8,166
Texas	112,280	112,542	117,146
East Texas	7,785	8,147	8,532
West Texas	52,906	53,596	57,552
Texas Gulf	21,586	21,047	20,361
Other Texas	30,003	29,752	30,701
Wyoming	16,988	17,036	13,542
Other Rocky Mountain	9,608	9,893	9,531
California	28,973	28,698	33,942
Foreign	†14,637	13,842	15,105
Total	**255,454**	256,396	263,179

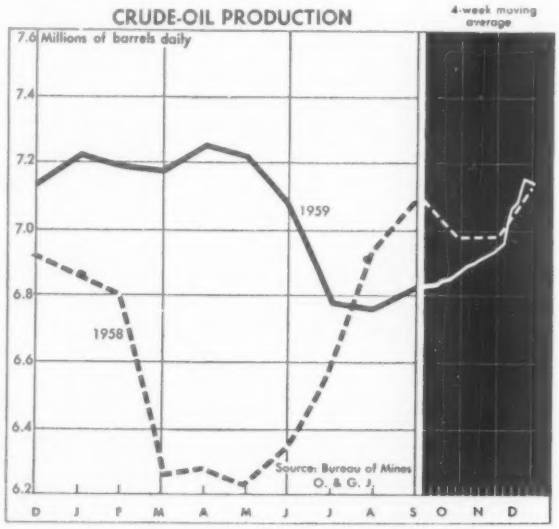
*Bureau of Mines. †Includes 5,133,000 bbl. in California.

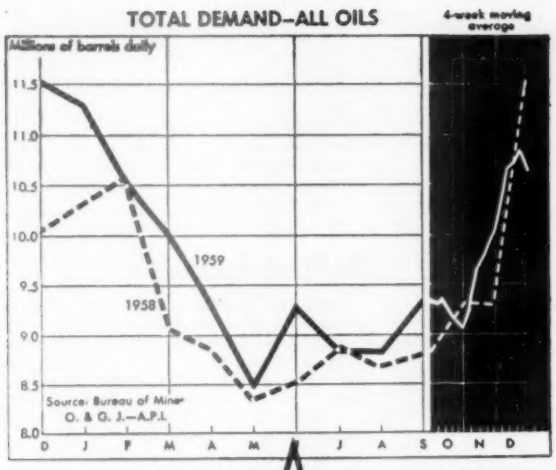
DAILY AVERAGE PRODUCTION FOR WEEK

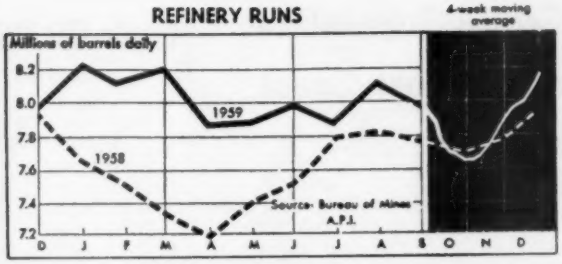
	January 2, 1960			Dec. 26
	Crude oil	Lease condensate	Total	total
Alabama	16,000		16,000	15,700
Arkansas	82,000	160	82,160	81,360
California	837,500		837,500	839,300
Colorado	129,800		129,800	129,600
Eastern	42,500		42,500	41,800
Florida	1,170		1,170	1,170
Illinois	218,400		218,400	217,600
Indiana	31,400		31,400	30,800
Kansas	†304,390		†304,390	†§336,900
Kentucky	74,300		74,300	75,900
Louisiana	928,250	117,900	1,046,150	1,045,800
North	107,250	5,900	113,150	112,800
South	821,000	112,000	933,000	933,000
Michigan	34,400		34,400	34,400
Mississippi	140,920	5,050	145,970	145,970
Montana	80,400		80,400	79,800
Nebraska	63,500		63,500	63,200
Nevada	100		100	100
New Mexico	289,600	6,500	296,100	296,100
North Dakota	62,000		62,000	59,000
Oklahoma	†533,700		†533,700	†541,200
Texas	2,566,000	81,200	2,647,200	2,647,200
Dist. 1	43,000	3,000	46,000	46,000
Dist. 2	110,000	8,800	118,800	118,800
Dist. 3	334,000	38,000	372,000	372,000
Dist. 4	180,000	9,800	189,800	189,800
Dist. 5	26,000	400	26,400	26,400
Dist. 6	107,000	9,500	116,500	116,500
East Texas field	141,000		141,000	141,000
Dist. 7-B	128,000	180	128,180	128,180
Dist. 7-C	125,000	3,320	128,320	128,320
Dist. 8	1,059,000	5,000	1,064,000	1,064,000
Dist. 9	205,000	2,200	207,200	207,200
Dist. 10	108,000	1,000	109,000	109,000
Utah	110,000		110,000	115,100
Wyoming	342,000		342,000	345,800
Others	‡310		‡310	‡360
Total U. S.	6,888,600	210,810	**7,099,450**	§7,144,160
Change from prev. week down			**44,710**	
Canada	†528,000		†528,000	†547,600
Total U. S. Prod.-Jan. 1-Dec. 31				2,571,945,000 bbl.
Same period last year (crude plus cond.)				*2,448,837,000 bbl.

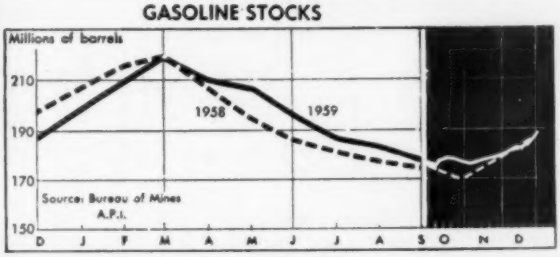
*Includes 58,455,555 bbl. condensate. †Week ended previous Monday. ‡Arizona, South Dakota and Washington. §Revised.

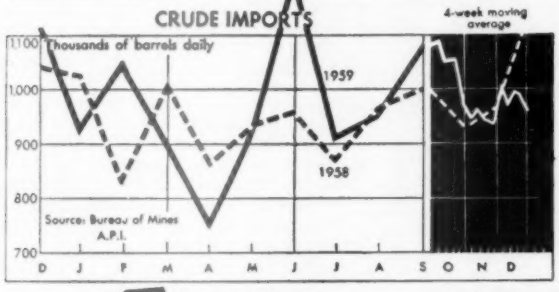
CRUDE-OIL PRODUCTION

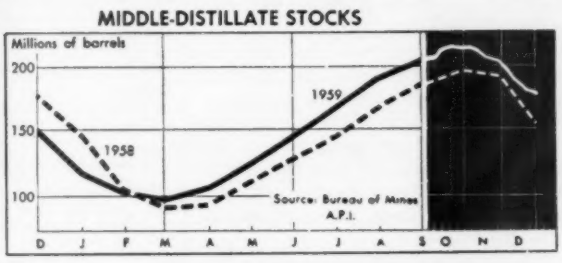


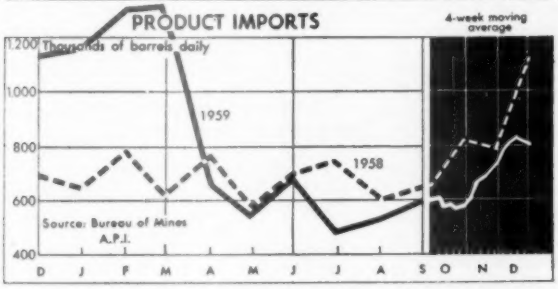


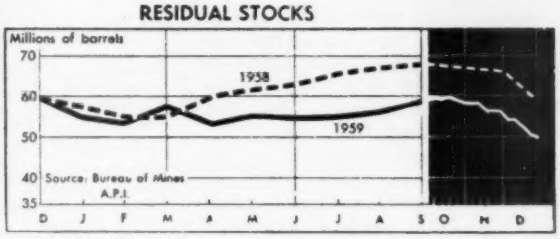












API REFINERY REPORT—JANUARY 1, 1960

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, January 1960—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,139	538.4	67.7	346.8	165.6	41,151	11,460	57,768	10,266	1,195	550.9	45.4	416.3	225.8
Appalachian:														
District 1	104	42.7	2.6	20.9	14.0	5,836	680	3,996	341	97	39.7	6.5	21.5	11.9
District 2	109	57.1	9.6	19.4	16.1	2,918	431	1,603	454	114	57.4	7.3	20.0	18.6
Ind., Ill., Ky.	1,592	853.2	91.0	372.9	217.1	32,684	5,703	23,985	5,385	1,512	738.9	80.0	359.6	223.2
Minn., Wis., Dak.	124	64.1	8.0	28.7	13.9	7,292	1,193	6,972	694	108	52.4	6.4	28.4	14.6
Okla., Kans., Mo.	749	400.4	7.3	235.1	26.0	18,051	1,252	10,691	1,204	770	416.0	22.7	210.0	40.8
Inland Texas	302	221.0	10.1	47.9	19.8	7,051	469	1,833	2,394	278	183.9	8.8	48.3	21.7
Texas Gulf Coast	1,890	981.2	149.7	515.4	159.4	24,674	2,362	17,129	4,892	1,961	979.2	142.9	564.9	182.2
La. Gulf Coast	713	392.0	100.0	153.9	55.3	9,712	1,764	6,241	887	699	343.6	81.2	184.5	50.4
N. La. and Ark.	100	50.0	5.7	19.9	8.3	5,033	719	2,505	199	92	45.3	5.8	19.1	5.8
Rocky Mountain:														
New Mexico	26	15.0	0.6	4.7	2.6	870	60	201	66	24	11.3	0.6	4.6	2.4
Other Rky. Mt.	295	145.9	3.4	70.1	31.6	5,729	250	2,467	1,150	287	136.4	4.2	62.8	37.5
West Coast	1,226	469.4	3.7	182.7	287.0	27,965	428	13,416	22,006	1,093	502.5	6.9	193.0	281.9
Jan. 1, 1960	8,369	4,230.4	459.4	2,018.4	1,016.7	188,966	26,771	148,807	49,938	8,230	4,057.5	418.7	2,133.0	1,116.8
Dec. 25, 1959	8,266	4,199.7	393.7	1,886.6	993.0	184,045	27,080	151,441	50,451	.....	.....	.....	.....	.....
Jan. 2, 1959	8,256	4,244.9	440.0	2,084.7	1,008.0	186,482	26,057	126,056	60,525	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Group 3 gasoline down; East Coast distillate up—

MOST wholesale markets were short on activity during the first week of the new year. The few changes in prices represented final action on trends that had been building up for several weeks.

Esso announced an increase in kerosine and distillate prices in its marketing territory. In general, postings moved up 0.5 cent a gallon on the East Coast and 0.3 cent in areas on the Gulf Coast.

This latest increase results in a barge price of 10.10 cents for No. 2 fuel in New York Harbor and kerosine at 11.10 cents.

At midweek it was too early to measure the influence of the Esso increase on Gulf Coast cargo prices. Reports from the Gulf Coast area show increases in postings by two refiners but these were in the middle range of quotations for the area and so did not change the low of the market.

If the refiners who are quoting No. 2 fuel at 8.375 cents decide to withdraw these postings, the formal gulf quotation will rise. The extent of under-the-market selling will be determined by weather on the East Coast for the next few weeks.

Since the lion's share of East Coast oil burners are in the northern states, cold weather in the area from Georgia to Virginia will not have any major effect on East Coast distillate demand.

There has not been enough spot selling on the Gulf Coast gasoline market to get a good fix on the low of that market. There were rumors of a cargo sale of premium gasoline at a price that would indicate a shipment to the West Coast.

It would take a firm order to test the actual low of the Gulf Coast gasoline market, but the general tone of this market seems to indicate that a true buyer, looking for regular gasoline, probably could shade 10.50 cents a little for 92-octane gasoline. He could get a better discount on premium.

Unbranded gasoline is available to jobbers on the Group 3 market at 10.00 cents a gallon. For the supplier who trades in volumes corrected to 60°, a Group 3 metered price of 10.00 cents is very low since some of the deliveries out of pipeline terminals will be at temperatures near zero.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill, Calif.	Oklahoma	Gulf Coast Tex.*	West Tex.† N.M.	Wyo. (sour)
14-14.9	$1.76	....	....	....	....
15-15.9	1.84	....	....	....	$1.81
16-16.9	1.92	....	....	....	1.86
17-17.9	2.00	....	....	....	1.91
18-18.9	2.08	....	....	....	1.96
19-19.9	2.16	....	....	....	2.01
20-20.9	2.24	$2.49	....	$2.35	2.06
21-21.9	2.32	2.52	....	2.38	2.11
22-22.9	2.39	2.55	....	2.41	2.16
23-23.9	2.46	2.58	$3.44	2.44	2.21
24-24.9	2.53	2.61	3.46	2.47	2.26
25-25.9	2.60	2.64	3.48	2.50	2.31
26-26.9	2.67	2.67	3.50	2.53	2.36
27-27.9	2.74	2.70	3.52	2.56	2.49
28-28.9	2.81	2.73	3.54	2.59	2.54
29-29.9	2.87	2.76	3.56	2.62	2.59
30-30.9	2.93	2.79	....	2.65	2.63
31-31.9	3.00	2.82	....	2.68	2.67
32-32.9	3.06	2.85	....	2.71	2.71
33-33.9	3.12	2.88	....	2.74	2.75
34-34.9	3.17	2.91	....	2.77	2.79
35-35.9	3.22	2.94	....	2.80	2.83
36-36.9	3.27	2.97	....	2.83	2.87
37-37.9	3.31	2.99	....	2.86	2.89
38-38.9	....	3.01	....	2.89	2.91
39-39.9	....	3.03	....	2.92	2.93
40-40.9	....	3.05	....	2.95	2.95

*Low cold test crude. †Sour.

Effective dates of broad changes: California, 9-11-59; East of California, January 3-10, 1957; Pennsylvania Grade 9-12-59.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.05-3.25
Conroe	3.23-3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.40
Middle District	4.22
Southwest Pennsylvania	3.95
West Virginia	3.77
Buckeye Grade	3.62
Illinois Basin	**3.00**

FOREIGN

Canada:	
Leduc-Woodbend	2.53
Redwater (Alta.)	2.42
Smiley (Sask.)	2.18
Pembina	2.38
Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.34
San Joaquin, 41°-41.9°, Puerto La Cruz	3.08-3.10
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes f.o.b. lifting port):	
Arabian, about 34°, Ras Tanura	$1.89
Iranian, 34.0°-34.9°, Bandar Masur	1.80
Iranian, 34.0°-34.9°, Abadan	1.81
Iraq, 36.0°-36.9°, Fao	1.82
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.67
Qatar, about 41°, Um Said	2.05
Middle East, E. Mediterranean:	
Arabian, about 35°, Sidon	2.29
Iraq, about 35°, Tripoli, Banias	2.29
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.57

Refined-Product Prices

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
★ Regular (91 octane)	10.00-10.25
★ Premium (99 octane)	12.50-12.75
Natural gasoline (26-70)	4.5
Breckenridge	4.0
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	10.25-10.50
Regular (92 octane)	10.50-10.75
Premium (98 octane)	11.75-12.00
California (rack) Los Angeles):	
Regular (88 octane)	11.65-12.15
Premium (94 octane)	12.65-13.15
Premium (100 octane)	14.00-14.65
Caribbean area (cargoes):	
Regular (87 octane)	10.125
Premium (97 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	10.50-10.75
Diesel oil (58 d.i. and above)	10.25
Distillate No. 1	10.25-10.50
Distillate No. 2	9.50
Gulf Coast (cargoes):	
Kerosine 41-43	9.50
Distillate No. 2	8.375
New York Harbor (barges):	
★ Kerosine 41-43	11.10
★ Distillate No. 2	10.10
★ Diesel fuel, 48-52 d.i.	10.40
Caribbean area (cargoes):	
Distillate No. 2	8.375

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max 1% S)	$1.80-1.90
Gulf Coast (cargoes):	
Bunker C fuel	$2.00
New York Harbor (barges):	
Bunker C fuel	$2.37
Caribbean (cargoes):	
Bunker C	$2.00
California (rack):	
Bunker C fuel, Los Angeles	$2.15

Tanker Rates (Long Ton)

(Latest reported spot fixtures)

★ Gulf-USNH, clean (ATRS+20%)	$3.42
Gulf-USNH, dirty (ATRS Flat)	2.85
★ Carib.-USNH, clean (ATRS—40%)	1.65
★ Carib.-USNH, dirty (ATRS—52.5%)	1.31

★ Denotes change from previous week.

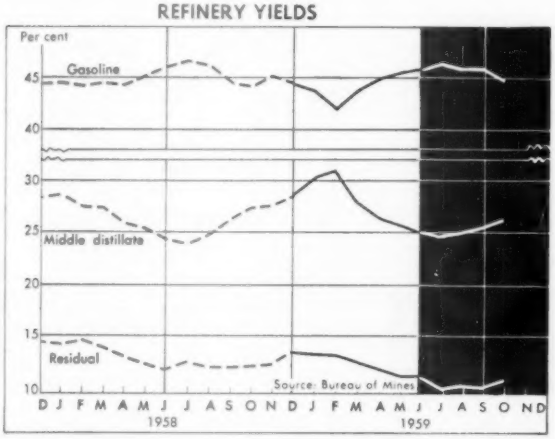
SUPPLY AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

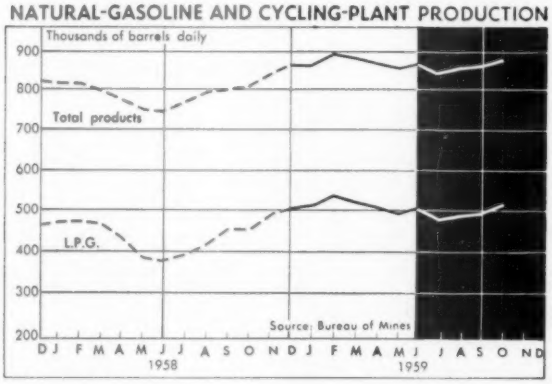
	Total demand	Refinery production	Stocks and of period†
GASOLINE			
December 1959*	3,990	4,160	188,970
November 1959*	4,000	3,940	176,000
October 1959	3,953	3,931	174,277
January 1959	3,751	4,058	199,075
December 1958	3,950	4,146	186,760
KEROSINE			
December 1959*	525	390	26,770
November 1959*	400	330	32,300
October 1959	262	287	32,396
January 1959	583	419	21,090
December 1958	572	374	26,040
DISTILLATE			
December 1959*	2,585	1,925	148,800
November 1959*	2,325	1,790	167,000
October 1959	1,514	1,736	181,840
January 1959	3,113	2,133	96,849
December 1958	3,179	1,955	125,101
RESIDUAL			
December 1959*	1,830	995	49,940
November 1959*	1,690	932	55,200
October 1959	1,316	869	59,506
January 1959	2,135	1,117	55,214
December 1958	2,084	1,105	59,508

*Preliminary. †Thousands of barrels.

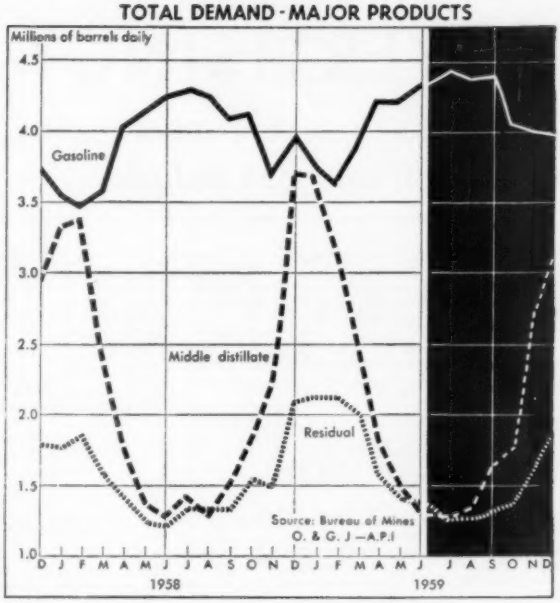
REFINERY YIELDS



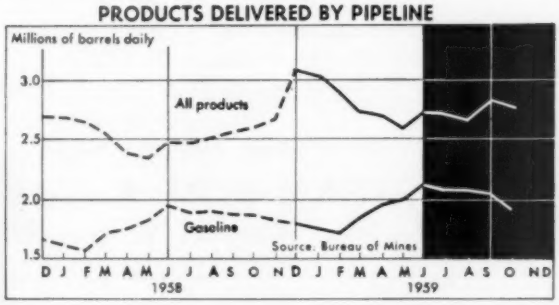
NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION



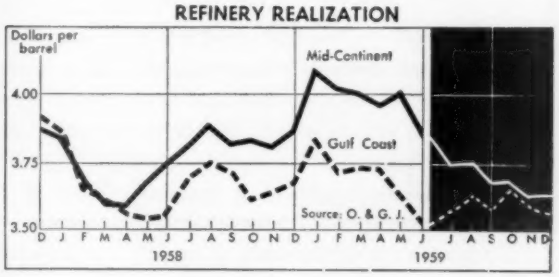
TOTAL DEMAND - MAJOR PRODUCTS



PRODUCTS DELIVERED BY PIPELINE



REFINERY REALIZATION



REFINERY REALIZATION

	Dec.* 1959	Nov.* 1959	Oct. 1959	Dec. 1958
Mid-Continent	$3.63	$3.63	$3.59	$3.86
Gulf Coast	3.58	3.59	3.62	3.67

*Preliminary.

Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel, and residual as published in The Oil and Gas Journal.

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1—WORTHINGTON Centrifugal Pump #1028299, 6", type UXS-2,100 gpm, 600 rpm, 3600 against total head 2888' @ 125# discharge press. Cast steel case & nozzles. Suction nozzle-6" ser. 60 flat face-Driven by

1—MOORE Steam Turbine #4832,9 stage-Form S-202-7-4, 1050 HP. Exch. 26", vacuum, CI Case 4" steam inlet, pump used 14,490# steam per hour with 125# inlet having 26" exhaust vacuum @ 2000 rpm-comes complete with

1—WORTHINGTON Barometric Jet Condensor.

1—PITTSBURGH Automatic Lectrodryer unit, standard model BY-1-R dual absorber type, fully automatic. Max WP 150#. Seamless vertical tank, ASME construction, 500 deg. F. max temp.

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10	Chrome	212-1580
4	Brass	460-840
1	Chr-Moly	355

TOWERS

Quan.	Size	Trays
1	7' x 40'2"	14
1	9' x 40'2"	10
1	10' x 40'2"	3
1	5'6" x 38'3"	14
1	6'6" x 38'6"	6
1	12' x 73½"	31
1	5' x 31'¼"	8
1	3' x 42"	12

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31,000'—3½" I.F. Drill pipe, Grade E. Sonoscoped—From $1.25 to $3.00 per ft. Don Harman Pipe & Supply, OR 7-4343, Oklahoma City.

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30 TYPE CSS-248, 500# WP, G-R Twin Section Heat Exchangers located Tulsa. Take all at $2250. Box L-642, Oil and Gas Journal, Tulsa, Oklahoma.

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FOR SALE—Longhorn Steer Horns, polished and mounted, six feet spread. Free Photo. Driscoe Bertillion, Mineola, Texas.

PIPE CHAIN Tongs—Armstrong 15 and 35 for 2" to 12" pipe. Army surplus, unused in excellent condition. Price $29.50 each. Layne Northern Company, Inc. Mishawaka, Indiana.

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GROWING INDEPENDENT gas company (Texas), has opening for engineer, experienced in reserve estimation, design and operation of gas gathering systems, compressor stations and process facilities. Please respond giving, resume of experience and personal data as well as salary requirements. Box L-635, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPLORATION GEOLOGIST

with minimum of six years experience in Permian Basin of West Texas. Applicant must be able to do original work and generate prospects. Position is available in Denver, Colorado. Please send complete resume to Superintendent of Exploration,

United Producing Company, Inc.,
P. O. Box 2732 Denver 1, Colorado.

OIL REFINERY PROCESS ENGINEERS for NEW CANADIAN REFINERY

For opeings in our Technological Department. Chemical Engineering degree and 3 to 6 years experience in Process Engineering and Technical Service desired. Send resume of experience, education, personal history and salary to R. C. Felt, Refinery Manager.

Irving Refining Limited
P. O. Box 1260
Saint John, New Brunswick
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Large independent integrated oil company has two or three supervisory operating positions open. Must have mechanical or petroleum engineering degree. Prefer from three to twelve years experience in all phases of drilling and/or production operations. Submit full resume along with transcript of grades if possible.

BOX L-632
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TULSA, OKLAHOMA

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Desire graduate engineers with oil field background, preferably with research and design experience. Engineers presently employed by Oil Companies will be employed only with the understanding and approval of their company. Please apply to Personnel Department in Los Angeles, P.O. Box 2274, Terminal Annex, Los Angeles 54, California, or in Houston, P.O. Box 3048, Houston 1, Texas.

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IMPORTANT POSITION offered in France for reservoir engineer with minimum six years experience. Knowledge of French preferable. Box L-653, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Experienced oil field supply salesman for Southern Michigan area. Position available immediately. Salary, car, expense account. Independent supply store. Reply to: Box L-645, The Oil and Gas Journal, Tulsa, Oklahoma.

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WANTED: Man experienced with oil field equipment and supplies, required as inside store manager to handle calls, paper work, customers, etc. Salary open. Southern Michigan location. Reply to: Box L-646, The Oil and Gas Journal, Tulsa, Oklahoma.

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in Midcontinent area of Oklahoma and Kansas. The experience and ability to plan and execute an active exploration program for a substantial independent company is required for this opening. All replies will be considered confidential. Please send personal summary complete with a detailed history of experience to:

The Oil and Gas Journal,
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SITUATION WANTED

MECHANICAL ENGINEER—Bilingual (Spanish-English) 11 years diversified design & administrative experience. 5 years domestic Co., 6 Latin America. Recently returned U.S. Seeks engr. position. Box L-626, The Oil and Gas Journal, Tulsa. Oklahoma.

PETROLEUM ENGINEER, married, 39, speaks Spanish, thirteen years in South America, Senior Production Supervisor, experience includes supervising cleanout rigs, compressor stations, water stations, pump stations, lease work. Will consider US or foreign employment. Box L-628, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEER and production supervisor, 28 years experience oil and gas well operations, gathering system, compressors, packaged gasoline plant. Current employment being terminated by sale of properties. Excellent health, reliable, references. Available in January. Now in west Texas. Box L-621, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST-Production Superintendent: Age 35, married, conscientious. 10 Years Experience in Assembling Acreage, Exploration, Completions and Workovers. Will delineate meritorious prospects, supervise drilling completion and developmental program. Why pay double? Box L-651, The Oil and Gas Journal, Tulsa, Oklahoma.

SALESMAN—41, Marketing major, 10 years experience, knowledge of petro-chemicals, oil production equipment. Excellent references. Box L-647, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—14 years Exploration and Development Geology, Land, Drilling, Production and Appraisal Experience. Can successfully supervise a one well or five hundred well program. Box L-654, The Oil and Gas Journal, Tulsa, Oklahoma.

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GEOLOGIST, M. S., 46. 15 years stratigraphic, structural, subsurface, wellsite, core and surface experience. Publications in U. S., U. K., Australia. Full resume on request. Will travel. Desires position in oil exploration. Box L-648, The Oil and Gas Journal, Tulsa, Oklahoma.

YOUNG MANAGER of oilwell servicing company, seeks supervisory/executive position with servicing or drilling contractor in any part of the world. 11 years domestic and foreign experience. Would establish and manage new company for any interested parties. Any challenging opportunity would be considered. Box L-611, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER (BS)—24, single, seeks employment. Will be discharged from Army in April. Locate anywhere. 15 months diversified experience. Resume and recommendations. Box L-652, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM GEOLOGIST, age 36, 10 years experience, primarily Mid-Continent Area, capable of evaluating areas and generating prospects, best references. Complete resume upon request. Louis McPherron, 402 Masonic Building, Shawnee, Oklahoma.

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FOR SALE: One acre, house, warehouse, stock of oil field pipe fittings. Terms. Liscomb, Box 621, Blanding, Utah.

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NEW PRODUCTS WANTED—Well-established, responsible company with complete facilities for developing, manufacturing and marketing oil field equipment is seeking new or improved products, preferably patented or patentable to add to its presently well-known line. Royalty basis or outright purchase. Initial submission should identify product and general use without revealing engineering and confidential detail. Submissions will be handled promptly and confidentially. Box K-994, The Oil and Gas Journal, Tulsa, Oklahoma.

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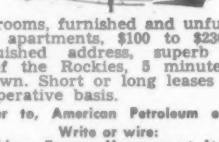

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LEASE AND DRILLING BLOCKS

FIVE WELLS, 15 BOPD settled production. Osage County, Oklahoma. Additional locations. Excellent equipment. By owner. Box L-638, The Oil and Gas Journal, Tulsa, Oklahoma.

PROSPECTIVE OIL LAND: Suitable townsite acreage in fee, E/35 acres, Sec. 16, Block JKL, PSL Survey, Hudspeth County, Texas, at intersection U. S. Highway 62 and F.M. 1437 Highway, south of Dell City, Texas. Write quickly, Jefferson G. Smith, 715 Littlefield Building, Austin 15, Texas.

OIL AND GAS MINERAL LEASES available in Dell City area of Hudspeth County, Texas. U. S. Geological Survey Map shows anticlinal axis nearby favorable for oil-gas structure. Am fee landowner of over 2,000 acres. Write quickly to: Jefferson G. Smith, 715 Littlefield Building, Austin 15, Texas.

FOR SALE: Oil leases in Ohio and Muhlenburg Counties, Kentucky, joining production and in Simpson County Kentucky close to production. Write, Robert Daugherty, Box 141, Central City, Kentucky or Phone 628.

72 ACRE Proven Green County Kentucky oil lease. Two wells drilled and equipped. Surrounded by proven territory. Price for quick sale $15000. Box 135, Horse Cave, Kentucky. Phone at night State 6-6314.

WANTED TO BUY Kansas production, any amount. Box L-655, The Oil and Gas Journal, Tulsa, Oklahoma.

5,000 ACRES offset production, Wayne and Holmes Counties, Ohio. Will sell all or part. Write, Box 864, Hammond, Indiana.

ROYALTY UNDER actively developing waterflood—Okmulgee County, Oklahoma. Engineering report and core analyses. Box L-649, The Oil and Gas Journal, Tulsa, Oklahoma.

SUBJECT: Biggest deal left in Kentucky Blue Sand.

In Taylor County, over 1,000 acres, production on 3 sides, biggest lease offset well 200 barrels a day at 450 foot deep, over 100 new wells in area adjoining block.

Need good oil organization with drilling money to develop this proven acreage immediately. Over 50 feet of pay reported on adjoining acreage. Some money plus carried working interest. Box L-644, The Oil and Gas Journal, Tulsa, Oklahoma.

Large Alaskan Drilling Block

50,000 acres in Copper River Basin. Interested in making contract with drilling contractor or major company. Dry hole and bottom hole money available.

Original leases, valid 5% royalty, 1st 10 years. Each well holds 2,560 acres. Complete geological information on hand. Well is spudded 30 miles south of this block. Major companies hold all other blocks in Copper River Basin. Area is served by two hard-surface highways.

W. C. Berry
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THE OIL AND GAS JOURNAL
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Pauls Valley, Okla.

(Continued from page 143)

California leasing climbs during 1959

All California leaseholders of tideland acreage were active in 1959 in lease-evaluation core programs. Although this activity is in the tight-hole category, it is known that all of the shore leases—except Parcel B off Santa Barbara County—showed favorable indications during the coring projects. Shipbuilders on the coast have been sent feelers by several offshore lease holders regarding platform design and cost matters.

At least one of the Santa Barbara County offshore parcels is almost certain to get a platform in 1960 as a result of 1959 coring. It is the Texaco Inc., Monterey Oil Co., Newmont Oil Co. parcel D. This parcel reportedly showed excellent results in preliminary drilling from floating and mobile platforms. In its financial statement for 1959, Monterey Oil Co. reported that a platform capable of accommodating 28 wells is under construction for installation on parcel D.

Things to come . . . Indications are that 1960's top exploration developments in the state will come from these areas:

. . . Townlot. The Continental M-G-M discovery has already touched off major lease plays in the general West Los Angeles-Beverly Hills-Culver City area. Look for increased drilling despite severe restrictions on drill sites, soundproof equipment, etc.

. . . Kern County. Continued cautious drilling in the San Emidio Nose area. A slowdown trend in the previously very active North Tejon field. Continued search along west side of Mountain View field.

. . . Gas drilling. If anything, gas drilling will pick up as economics are still very favorable for gas sales as state's population continues to boom. Vernalis and Arbuckle to probably dominate news.

. . . Offshore. At least one and possibly three platforms will be built on the Santa Barbara County offshore parcels. Little likelihood of state offering additional acreage until more is known about the five parcels awarded in 1958.

Kentucky well abandoned

In Morgan County, Kentucky, on Stacey Fork, Sun Oil Co. has abandoned its wildcat 1 J. D. Haney. Test topped Corniferous lime at 1,529 ft. and Silurian Big Six sand at 1,694 ft. No commercial shows were encountered to a total depth of 1,750 ft. and well has been plugged.

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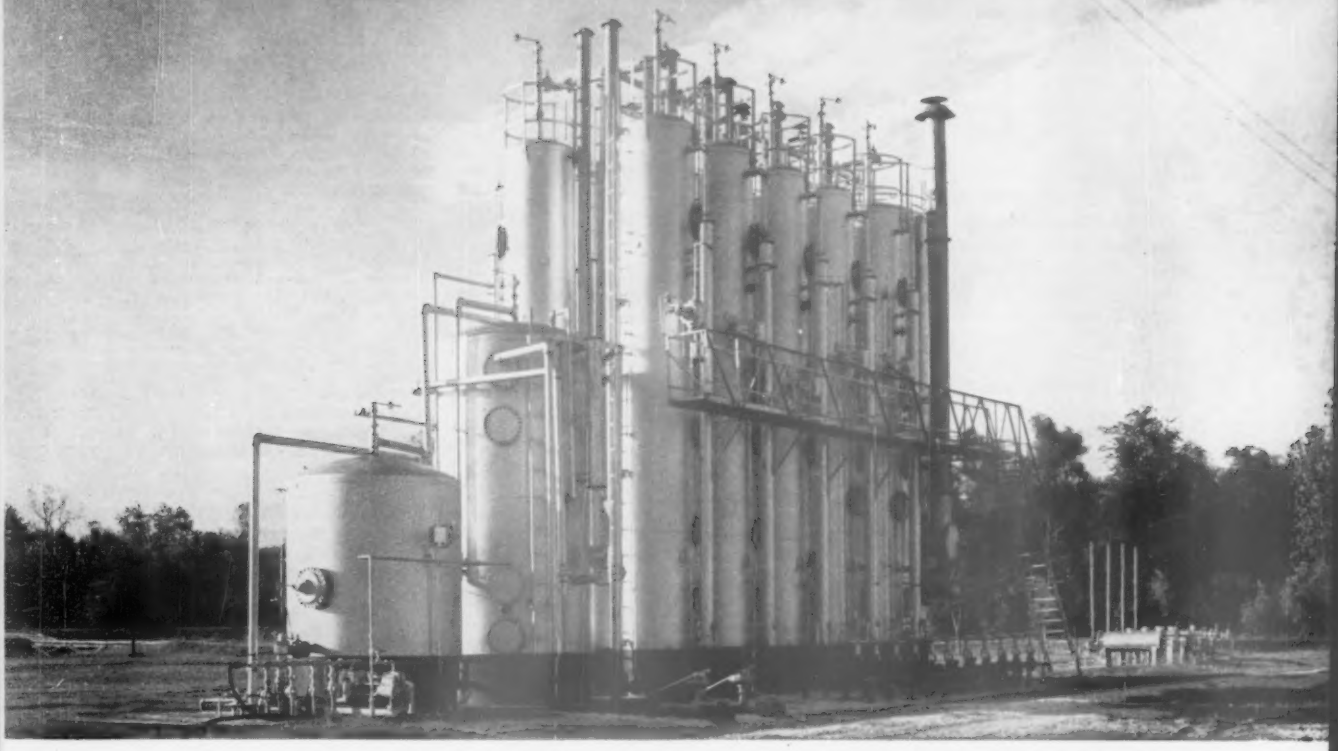

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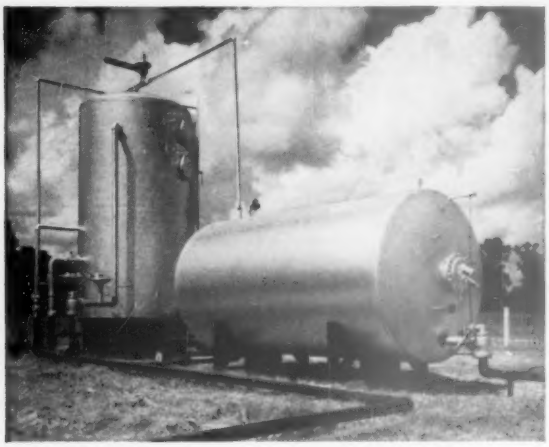

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